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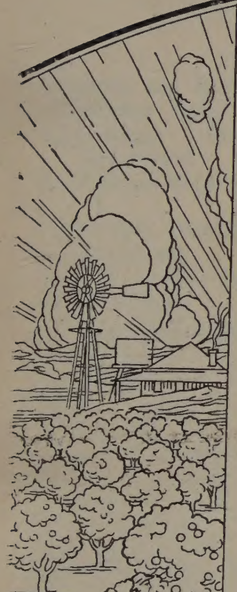

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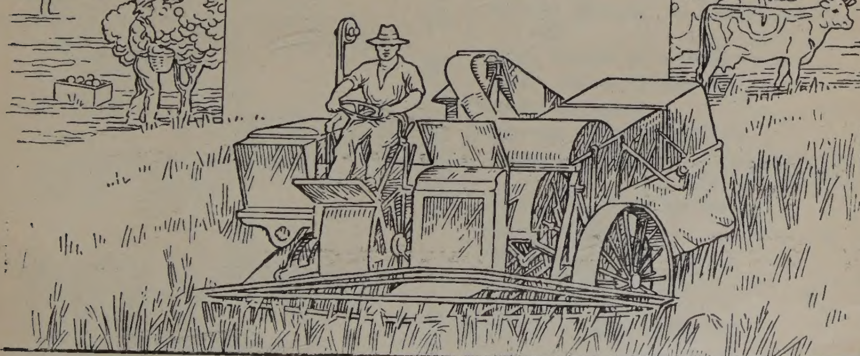

JANUARY to JULY, 1938

Vol. XLIX. Parts 1 to 6.

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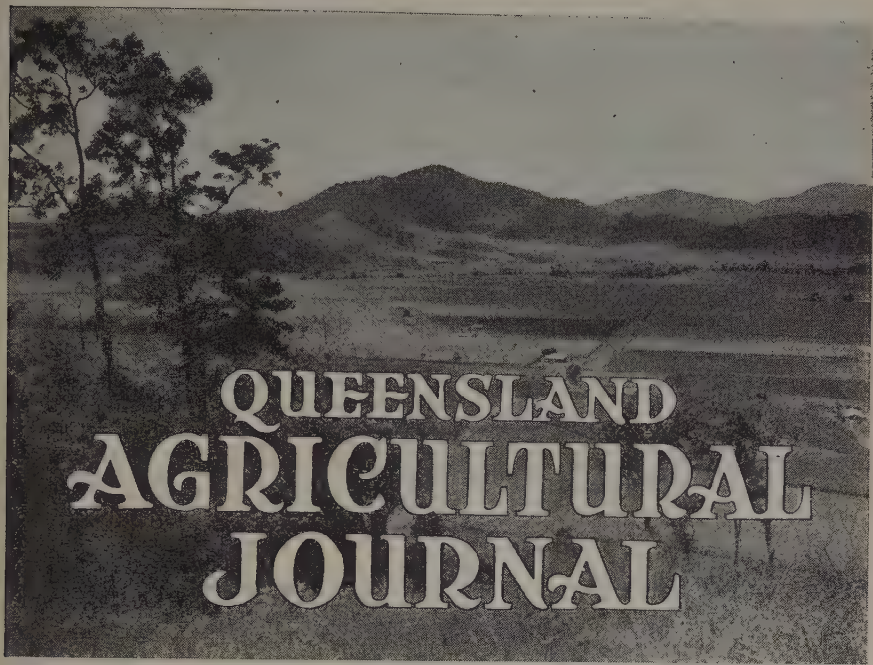


Vol. XLIX. 1 JANUARY, 1938. Part 1

Event and Comment

The King's Message to his People.

BROADCASTING a seasonal message on Christmas Day, His Majesty the King expressed gratitude to the people of the Empire for their love and loyalty in "this unforgettable year."

The King's message was:—

"Many will remember the Christmas broadcasts of former years, when my father spoke to his peoples at home and overseas. As the revered head of a great family, his words brought happiness into the homes and hearts of listeners all over the world. I cannot aspire to take his place, nor do I think you would wish me to carry on unvaried the tradition which was so personal to him.

"But as this is the first Christmas since our coronation, the Queen and I feel that we want to send you all a further word of gratitude for the love and loyalty you gave us from every quarter of the Empire during this unforgettable year now drawing to an end.

"We have promised to try to be worthy of your trust. This is a pledge we shall always keep.

"As we look back over the year now closing, we see over parts of the world the shadows of enmity and fear, but let us turn to the message that Christmas brings, of peace and goodwill. Let us see that this spirit shall in the end prevail. Every one of us can help by making that immortal message the keystone of our daily lives. And so to all of

you, whether at home among families as we are, or in hospital, or at posts carrying on the duties that cannot be left undone, we send our Christmas greetings, and wish you, under God's blessing, health, and prosperity in the years that lie ahead."

The Dignity of Agriculture.

"AS life becomes more and more complex, parents are finding an increasing difficulty in determining a career for their sons. Probably subconsciously the question associated with the choice is—What avenue offers security, dignity, and a competence?" That question formed the text of a recent review of the conditions of primary industry in Queensland by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock.

Continuing, Mr. Bulcock said:—

"Carefully one reviews the professions, the trades and the callings and the dubiety of choosing a policy of chance, which in 99 cases out of 100 leads to unskilled, untrained callings.

"Few people rise to eminence in the professions, while failures are not unknown. The trades offer security under certain favourable conditions, but the tragedy of the unskilled is a bitter blot on organised society.

"No training, however, makes the individual secure, for permanent security is not to be found in the established callings.

"History teaches us that the nations that are most secure, most prosperous, and soundest are those that have continued to keep their feet in the soil, so that in spite of advances in modern science it is clear that the persons engaged in growing the foodstuffs and the clothing of a people are likely to be the most secure section of the community.

"So, security suggests that the youngster should tread the road of rural industry in one or other of its several branches. Here in Queensland the line is fairly evenly divided between the main branches of rural enterprise—animal husbandry and agriculture. In the former division much more capital is needed to launch an undertaking than in the case of the crop farmer, but be the undertaking great or small, the individual engaging in it has the satisfaction of knowing that he is a nation builder.

"One often wonders why the agriculturist is regarded as a class apart. Why, for instance, the group that produces our wealth and carries all other sections of the financial community is not rightly appraised? The answer is simple. The other sections of the community do not understand. But happily there is a world-wide consciousness dawning which will speedily place the agriculturist in his correct alignment.

"The fundamental point for consideration is that agriculture is a secure calling, but an agricultural education is essential, experience is necessary and a careful selection of soil imperative. Indeed, the agriculturist, who is earnest and sincere, is by the very nature of his calling practically sure to earn a competence.

"Is agriculture a dignified calling? Just as the producer wears the mantle of the Creator and as he is required to be resourceful, to be an individualist, to have traits of character which no other calling tests so sternly, so it may be granted, in spite of opinions to the contrary, that agriculture is one of the most dignified of human vocations. It is a calling that appeals to the best that is in a man and develops in him a realisation of national service. In this regard, perhaps, the farmer's

prestige has to a degree been lowered by the tendency on the part of certain sections to parade constantly instances of poverty and hardship, and so create an impression that production and poverty are synonymous terms.

"Of course, pioneering may mean hardship, and there are admittedly instances of poverty, but this condition is not confined to agriculture. Undoubtedly it is this unhappy propaganda that has created an impression that farming cannot pay, and has deterred boys from taking up a farming occupation.

"Here in Queensland we are on the verge of a new conception of agriculture. We must abandon one form of pioneering for another. The days are gone when a brave heart and an axe were sufficient to carve out a home and establish a competent production unit. The period of soil exploitation which has characterised our agriculture for so long is passing. Efficiency, and efficiency only, will hold our markets for us and so we turn to that new form of pioneering—the application of modern science to agriculture. The exponents of this school are to be found in increasing numbers amongst our farming communities, the products of agricultural training and study.

"As in all forms of human endeavour, specialisation is the order of the day, but while the professional specialises in one branch of work, the successful agriculturist must be a specialist in each branch of his undertaking, and the duty of the State is to provide that training that fits him for the calling. . . . . But the only title to land is to use it properly, and, once again, the mind turns back to education.

"Fortunately, the fundamentals of agricultural education are well established, and while different opinions are expressed from time to time in respect to methods of training, it is clear that the ideal is to combine the theories of agriculture and animal husbandry with the practical side of production. . . . . The Queensland Agricultural High School and College provides a sound agricultural education. It opens to the student the correct approach to the problems confronting him; enables him to avoid the costly errors that lead to failure; and teaches him the dignity of labour and the joy of the open air and freedom. It sets his feet on the road to security and achievement. But armed with a diploma, the student must not think he knows all there is to be known about agriculture. If he has absorbed the rudiments of this complex science he has done particularly well. At this point he should obtain a job—deliberately a job—on a good farm and acquaint himself with production problems from the producer's angle.

"In a few years and while still in his twenties he should seek a place of his own. We must avoid at all costs training boys to be merely farm labourers. We need farmers, educated, thoughtful men, capable and ambitious, filled with a sense of responsibility and a realisation, and an appreciation of the dignity of their chosen careers. . . . .

" . . . . So the choice lies between the farm and the science branches of agriculture. Each is dependent on the other, and each offers a security, a dignity, and a satisfaction that is shared by no other profession. Might I conclude by saying that I trained in agriculture, and if I had my time over again I would follow the same course. I envy the boys of to-day their improved opportunities for training, and urge parents to remember that a life on the land has compensations not enjoyed by city workers."

The Minister's New Year Message

1937, with all its trials, disappointments, and reverses, draws to a close. Fortunately the New Year dawns with a promise of better things for the farming community.

The grim hand of drought no longer clutches our land and owing to improved conditions, overseas customers are able to purchase many of our goods at a reasonable price. I sincerely hope that any trade agreements entered into during 1938 will strengthen our trade relations with the United Kingdom and other countries purchasing our products.

However, I feel that we can confidently go forward to the New Year hopefully and cheerfully, with the Department of Agriculture and Stock and the producers continuing that close co-operation that has made such an important contribution to a solution of the many different questions that have arisen in the past and will continue to arise in the future.

On behalf of the Officers and Staff of my Department, I extend to the Primary Producers of the State and their families best wishes for a Bright and Happy Christmas and a Prosperous 1938.

Frank. W. Bulcock

Renovation of Paspalum Pastures.

C. W. WINDERS, B.Sc.Agr., Assistant Research Officer.

THE very poor response shown by many coastal paspalum pastures to the rains which fell during October and November demonstrated to dairy farmers in the south-eastern quarter of the State that their pastures have all too frequently lost a good deal of their recuperative powers. Whilst some of the deterioration of the pastures is attributable to the effects of the prolonged dry conditions experienced during the years 1936 and 1937, it is a fact that a decline in productivity and responsiveness of many long-established paspalum pastures has been in evidence for a number of years. In 1924 the Department of Agriculture and Stock instituted paspalum pasture renovation trials at various North Coast centres, and numerous trials have since been conducted throughout the coastal dairying strip from Gympie to the southern border. As a result of these experiments and of privately conducted trials it is possible to indicate, in a general way, the methods of pasture renovation which may be expected, under normal circumstances, to yield payable results in Southern Queensland.

In presenting the following short account of the recommended systems of paspalum pasture renovation, it must be emphasised that the best procedure to adopt will be determined largely by the requirements and the limitations of the individual farm. For instance, a fairly young pasture on a friable soil will need less severe mechanical treatment than will an old, sod-bound pasture on a much-compacted soil. Again, unstumped land cannot be renovated with the ordinary ploughs, and other implements must be used. The farmer contemplating renovation work is advised to give the matter careful consideration, before embarking upon a scheme, in order that the greatest possible benefit may be obtained from the resources at his disposal.

The primary objects of pasture renovation are to restore the pasture, as far as is economically possible, to the productive capacity of its early years, and to maintain its productivity at a high level. For both purposes the pasture must be broken up to some extent, the soil kept opened up to permit rains to enter and soil bacteria to function, and a sufficient supply of plant food maintained. The principles underlying these renovation measures need not be discussed here. It is sufficient to state that it has been amply demonstrated that the periodical breaking up of the pasture and its underlying soil and the adequate feeding of the pasture are necessary.

Renovation by the Use of Tine and Pick Implements.

The simplest method of renovation is to cultivate the pasture by means of tined implements. Narrow tines, spaced about 5 inches apart, are drawn through the sod and the soil. If the operation is performed, to a sufficient depth, first in one direction and then at right angles to that direction, the paspalum plants are appreciably pruned and the soil much disturbed. The effectiveness of the operation depends largely upon securing adequate penetration. Unless at least three, and often four, strong horses, or equivalent motive power, are available, penetration to the desirable depth of about 4 inches cannot be achieved. Where the pasture is in a particularly bad condition it becomes impracticable to employ horses for renovation purposes and a

tractor or motor truck must be used to draw the renovator. It is useless to attempt to renovate a matted paspalum pasture without sufficient pulling power. Merely scratching the surface of the sod effects no appreciable improvement in the pasture.

There are various types of tined paspalum renovators on the market in Queensland. For general purposes a stump-jump, flexible-tine implement is preferable to one with rigid fixed tines. A popular type of stump-jump paspalum renovator, which is sold for about £20, is illustrated (Plate 1). This machine has nine tines spaced 5 inches apart and covers a width of 3 feet 6 inches at each stroke. Points of various types can be obtained for spring-tine renovators. For paspalum pasture renovation the tickler points generally are used, but, if practicable, a wider point may be used with advantage when cross-renovating.

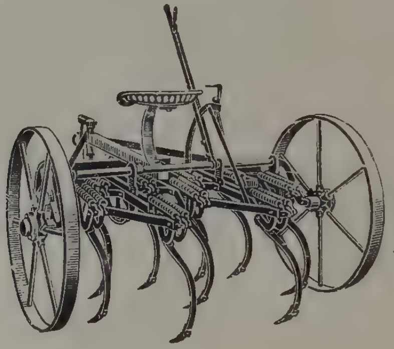


Plate 1.
A stump-jump paspalum renovator.

Another type of machine which is claimed to perform useful pasture renovation work is the power-driven pasture rotor (Plate 2). The tearing of the sod is done by broad, chisel-pointed pick tines or sharp-pointed tines attached to a revolving rotor fitted to the rear of a tractor. This machine has not been tested in official trials in Queensland, but it appears to be as efficient as any other implement for partially breaking up the pasture. Under some conditions the use of broad, pick tines might tend to leave the pasture area in a rough condition, and it may then be advisable to substitute the narrower, diamond-point tines.

Renovation should be carried out at a time when regrowth of the pasture is not likely to be retarded by cold weather or by dry conditions. Slow recovery of the pasture means not only lower production but also susceptibility to weed invasion. Renovators will not work satisfactorily when there is a big body of grass, and the pasture should first be brought into a suitable condition by mowing, by close grazing, or by other appropriate means. Any accumulated droppings should be scattered, by harrowing, prior to renovating.

It is usual to sow clover seeds on the pasture directly after renovation. Whilst the best time for sowing clovers is the early autumn, earlier plantings usually are effective. Some of the seed may germinate shortly after sowing and the seedlings be destroyed by hot weather, but a large proportion of the seed will remain dormant until the advent of cooler weather and germinate seasonably. The best clover to sow is white clover, but it is a very fickle grower in Queensland and in numerous

instances fails to establish or else does not survive for many years. Nevertheless, perseverance with the plant is recommended, since its presence in a pasture is of considerable value. A sowing rate of 2 lb. an acre is recommended, and in all cases 1 cwt. or more of superphosphate should be applied with the seed. White clover is favoured for pasture purposes mainly because it provides late winter and spring feed. Its value, as a leguminous plant, in assisting the growth of the paspalum is not generally recognised. This effect of legumes on grasses leads one to suggest that more use might be made of the summer-growing lespedeza, which already is naturalised in parts of the Gympie and Caboolture districts.

No method of renovation which does not involve the use of the plough or similar implement can be regarded as conferring a long-period benefit upon the pasture.

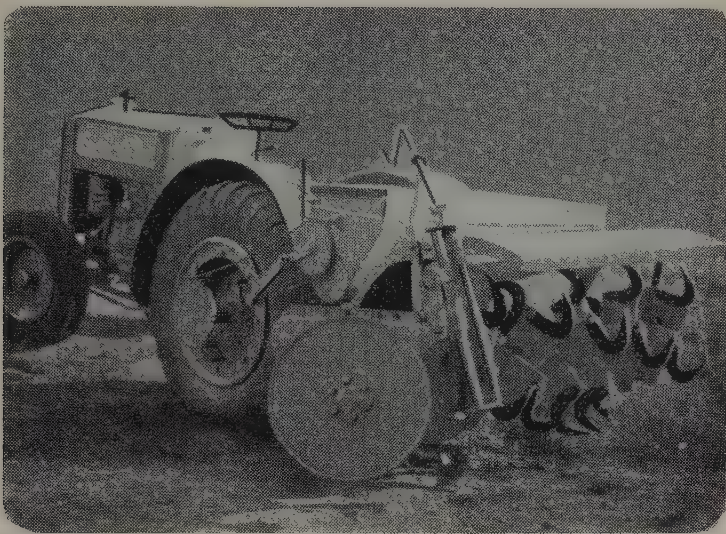


Plate 2.
A tractor-operated pasture rotor fitted with pick tines.

Renovation by Means of Ploughing and Similar Operations.

The mouldboard plough has been shown to be extremely useful in renovating paspalum pastures. On cleared land the ordinary English mouldboard plough can be used, but where the land contains stumps and roots it is necessary to employ a stump-jump mouldboard implement. Furrows 6 to 8 inches wide and 3 to 4 inches deep should be turned. Ploughing in this fashion turns the furrow slice on its side and sufficient pieces of the grass remain protected to provide an even regrowth. Shollower ploughing tends to turn the slice right over and to expose all the roots to the sun and wind, thus destroying a considerable amount of the grass. A mouldboard plough does not leave the ground in very rough condition, and light harrowing subsequent to ploughing will leave an even surface.

Disc-ploughing of paspalum pastures is less satisfactory than mouldboard-ploughing, particularly on hard soils, since the disc-plough tends to scatter the soil in large clumps, making levelling-off difficult.

Fairly satisfactory renovation can be performed with the rotary hoe. The sod and the soil to the depth of operation are chopped up fairly finely, and re-establishment from pieces of the grass may not be very uniform over the field. No doubt seedling growth will assist in thickening up the pasture cover, but usually it is found that regrowth following mouldboard ploughing is superior to that following rotary hoeing.

On undulating or hilly country (particularly where it is necessary to employ a hillside plough), all furrows should conform to the contours of the land. By ploughing across the slope, soil erosion is reduced to a minimum.

The time of renovating by ploughing or similar operation may be varied to suit the requirements of the farm. In specially favored localities, where the winter rainfall conditions are suitable, the farmer may desire to sow down winter-growing pasture plants on the renovated area in order to provide good winter and spring grazing. Renovation towards the end of summer, but prior to the finish of the summer rains, will leave the land in good condition for the establishment of grasses such as Wimmera ryegrass and Italian ryegrass, which will provide grazing while the paspalum is slowly re-establishing itself. Where the usefulness of winter pastures is strictly limited, it is advisable to renovate sufficiently early in the summer to ensure rapid regeneration of the paspalum and the production of a good body of feed with which to go into the autumn and the winter. Whatever time is selected for renovating, a sowing of white clover, and in some instances red clover in addition, should be made, together with an application of superphosphate to encourage the growth of the clover.

Whilst land carrying a very dense crop of grass is difficult to plough, it is advisable to turn under as large a body of grass as the plough will handle. The more grass which is added to the land the better will be the condition of the rejuvenated pasture. The main advantages of ploughing, &c., over less severe forms of renovation are that a greater bulk of organic matter is added to the soil, pruning is more drastic, and the land is rendered more receptive of rains and dead leaves, &c., added subsequent to renovation.

A ploughed pasture, once re-established, is more productive for three or four years than is a similar pasture renovated with a tine or pick implement. There is, however, a progressive decline in the response of renovated pastures, and it may be necessary to replough the pasture every five or six years. It is a good plan to make a point of ploughing-up a fresh portion of the pasture each year for a few years, and then repeat the renovations in the same order.

Renovating by Means of Rotation of Pasture and Crops.

There is no known means of renovating a paspalum pasture so that, without further mechanical treatment, it can be maintained in a highly-productive condition for a long period of time. It must be recognised that a single tine cultivation or a ploughing will have an effect on the pasture for only a short number of years. Tine renovation effects a moderate improvement in production. Ploughing confers a somewhat greater benefit on the pasture. It remains to describe a renovation system which improves on the production from the two already outlined, but which is much more limited in its application.

Crop rotation is accepted as sound agricultural practice for most crops in all parts of the world. It is recognised, further, that, by inserting a 3-5-year stand of pasture in the rotation at fairly frequent intervals, the structure of the soil can be maintained in a desirable condition for most crops. It has been shown, also, that by making a proper selection of crops to rotate with the pasture, the pasture can be made extremely productive during its relatively short life. These facts are significant to Queensland dairy farmers, many of whom regularly crop considerable areas on their farms. In the coastal belt, where paspalum is grown, crop-farming is not yet extensively practised, but there is a growing tendency for dairy farmers to grow more fodder crops, such a maize, sorghums, cowpeas, and lucerne. Probably the best system on coastal dairy farms would be to rotate a paspalum and legume pasture with crops such as those mentioned. Considerable benefit would be conferred on the pasture if a leguminous crop, such as cowpeas, or, better still, lucerne, immediately preceded the sowing of the pasture.

Supplying Plant Foods to Renovated Pastures.

Under the system of renovation last described it is possible to ensure that the pasture is sown down on land rich in available plant foods. Where purely mechanical forms of renovation are practised, unless very large quantities of grass, &c., are ploughed under or are allowed to rot down at fairly frequent intervals, the soil is not enriched to any marked degree. This deficiency can be met to only a slight extent by applying farmyard manure and by scattering accumulated droppings. In some instances the use of artificial fertilizers has conferred an added benefit, but the exact place of fertilizers in pasture renovation is by no means clear. In some districts the problem is complicated by the effect of soil acidity and other soil characteristics on the availibility of applied fertilizers, and everywhere the erratic nature of the rainfall causes wide variations in the response of pastures to added fertilizers. The best recommendation that can be made at present is that farmers test, under their local conditions, the relative values, for stimulating pasture growth, of superphosphate and sulphate of ammonia, both separately and in combination. Between 1 cwt. and 2 cwt. of each should be applied. In cases where the soil is known or believed to be very acid in reaction and where clover does not thrive, a dressing of pulverised limestone at the rate of 10 cwt. to the acre, or an equivalent amount of other forms of lime, should be tried.

WATERPROOFING MIXTURE.

"Lime-tarred" hessian is proof against vermin and rain. Take three-quarters of a kerosene tin full of tar and when nearly boiling stir in gradually (air slaked) powdered lime to make a creamy mixture. It is ready for use when it froths. Hessian so treated will last for years. Apply while hot with a tar brush, and give a second coat when the first has dried.

Poultry Keeping on the General Farm.

P. RUMBALL, Poultry Export.

POULTRY raising is now a very definite and important branch of primary industry. This is due largely, in the first instance, to the labours of the specialist breeder in the production of high producing strains; secondly, to the modern method of reproduction and distribution of chickens; thirdly, to more efficient and organised marketing; and lastly, to the practice by poultry raisers of more or less scientific principles of breeding.

Plate 3.
Bred from Vigorous Stock.

Although the specialist poultry breeder plays a most important part in the maintenance of a highly organised and efficiently conducted industry, considerable quantities of our eggs are produced upon the general farm, and if an expansion of the poultry industry is to take place, such expansion would be sounder as a definite part of general farming than as a specialised industry.

During recent years there has been a very definite increase in the production of eggs, as indicated by the ever-increasing quantities that are exported overseas. Overseas export, however, can only be practised during a few months of the year. Fortunately for the industry this period corresponds with the period of peak production, offering a ready means of effectively dealing with the surplus production that occurs over that particular period. There is, however, no definite break in

production after the export season closes; consequently supplies are temporarily in excess of home requirements, and storage for winter use has to be resorted to.

The first cost of the egg with the added storage charge prevents eggs so treated being sold at prices that will encourage the consumption of extensive supplies; consequently there is a limit to the number of eggs that can be stored for winter use.

Expansion of the industry must go hand in hand with increased local consumption, and this is only possible by creating in the consumers' minds a greater confidence in the internal content of the egg than has been the case in the past.

The confidence of the consumer is largely in the hands of the producer. The fowl produces an article of diet invariably in an almost perfect condition. It therefore remains for the producer, for his own protection, by the exercise of care and efficiency to maintain it in this form.

HOUSING.

To obtain the best results from poultry good housing is as necessary as good stock, good feeding, and good management.

It is not necessary to have elaborate housing, but they must possess the following features:—Correct ventilation, freedom from draughts, freedom from moisture, and have sufficient room for the comfort of the birds.

Poultry houses may be built of a variety of shapes and materials or old sheds or barns may be converted. If a new house is to be built, iron and sawn timber are recommended as being the most suitable material for construction purposes.

Systems of Housing.

There are three practices commonly adopted, viz.:—

(1) Intensive, where the birds are kept entirely under cover;

(2) Free range, where a house is erected to provide sleeping accommodation and unrestricted liberty permitted; and

(3) House and yard, where a house is provided for sleeping quarters, and liberty is restricted by the erection of a netted run.

Under the intensive system the birds are afforded the maximum protection from climatic conditions, ensuring a greater stability in production. The health and condition of the birds are readily observed by the farmer. Further, it is possible to thoroughly free the house from excreta at regular intervals.

Under the free range system some soil contamination from the excreta of the stock naturally takes place, but, owing to the unrestricted range and the feeding on the soil by plant life, soil contamination does not become serious. The birds are, however, exposed to climatic variations, and egg production is not as stable as under the intensive system. There is, however, the compensation in the reduced cost of feeding, as birds on range gather a good deal of food in the form of insect life, grass seeds, &c.

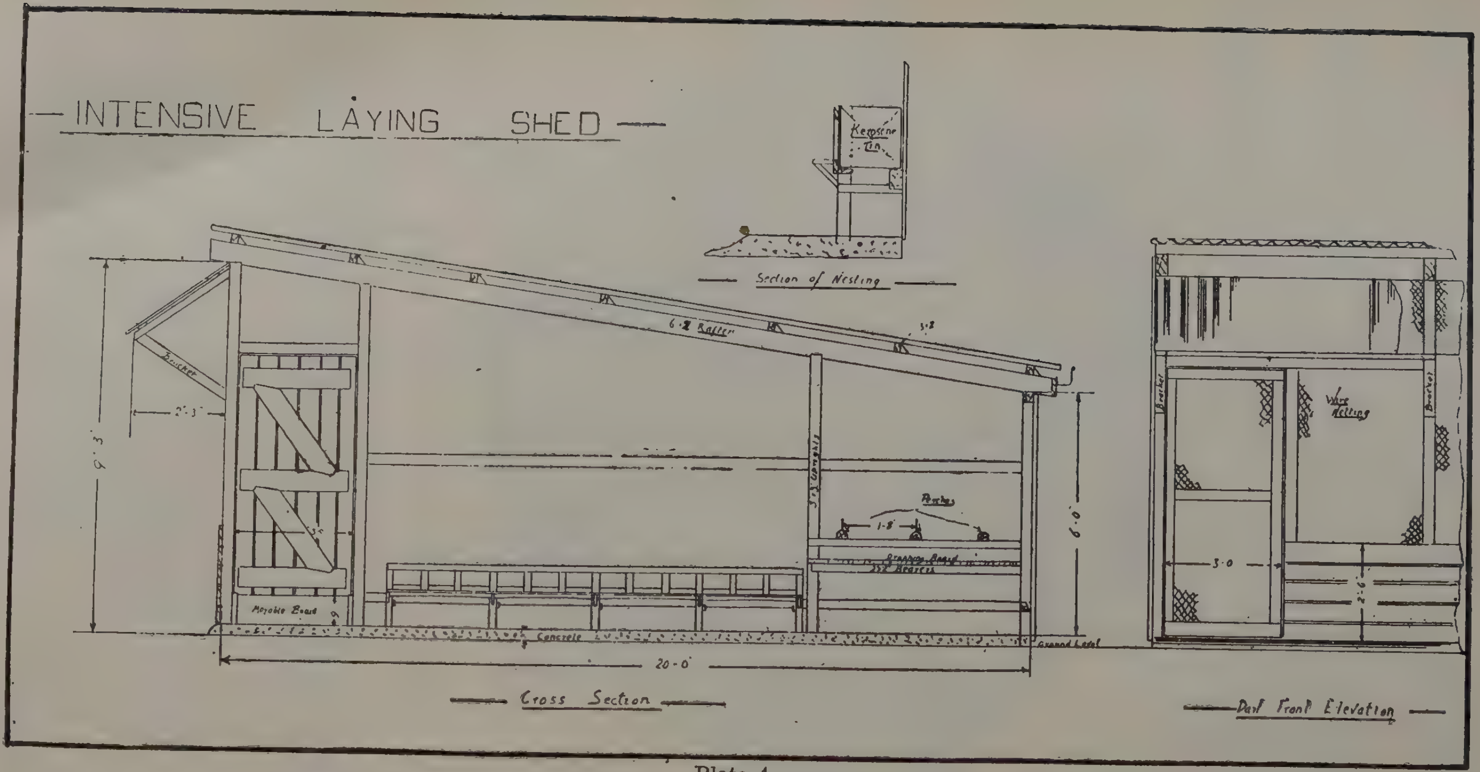


Plate 4.

SHOWING END SECTION AND PART FRONT ELEVATION OF INTENSIVE LAYING SHED.

End section with the exception of door and battens to carry the iron, should be erected every 10 feet in a shed of these dimensions.

The yard and house system has the disadvantages and none of the advantages of both the free range and intensive systems. The birds are exposed to the climatic conditions as much as they are under free range, and cannot gather any of their food supply as the netted run becomes bare in a very short time. The most serious disadvantage, however, of this system is the soil contamination of the pens.

Where a large number of birds are to be kept the intensive system of housing is recommended, but for the farmer keeping 50 to 100 birds the free range system offers many advantages.

Intensive Housing System.

Under this system of housing, as previously mentioned, the birds are kept entirely under cover in fairly large sheds, and in relatively large numbers. This being so, strict attention has to be paid to the physical condition of the bird, and to the question of feeding. As the bird only has a very restricted space, 4 square feet per bird being about the correct area, exercise has to be promoted to ensure the birds being kept in good condition. This is done by having scratching material or litter, such as grass, straw, leaves, or chips strewn over the floor, to the depth of 4 to 6 inches, and all the grain portion of the ration being fed in it. This naturally promotes a good deal of scratching on the part of the bird in search of grains that have become covered, and it should be patent to all poultry raisers that the feeding of the evening grain should not be left until the day is drawing to a close. Many farmers are in the habit of allowing a good deal of range to their birds, with the consequence that they gather a fair amount of natural food, and naturally do not consume as much as birds kept entirely under cover. If at any time poultry breeders keeping birds under such conditions think it desirable, on account of the damage done by their poultry to crops, hay-stacks, &c., to change over to the intensive system, the question of feeding assumes a most important point; in fact, any person keeping poultry under these conditions must give the question of feeding the utmost consideration, as it is impossible for the birds to procure anything but what they are supplied with. The overlooking of this point by many poultry farmers has caused this system of housing to be condemned.

Types of Intensive Laying Sheds.

There are several types of laying sheds, the shape of the roof being the principal point, but as the majority of poultry raisers have to do the erection of their own sheds, the lean-to type will prove most acceptable. The illustration shows the cross section of a shed, 20 feet deep, and of indefinite length. This shed can be built in sections of 20 feet, and provision made for additions as required, each section holding 100 laying hens.

The cross section shows a veranda, which commences just under the rafters in front. This veranda serves to prevent a good deal of rain beating into the house from the front, and by not going right to the top of the roof allows a free circulation of air. If it is desired the roof could be extended by 3 feet and the veranda not used, but in that case the height of the shed in front could be a little bit less. Ventilation is also provided for at the back, the iron going from the floor level to the bottom of the 6-inch rafter. This allows a 6-inch space right along the back of the shed between the battens which carry the iron at the back and the roof. This space is protected to some extent from the driving influence

Plate 5.

ON A QUEENSLAND POULTRY FARM. THE INTENSIVE SYSTEM ADOPTED WHOLLY FOR LAYING STOCK.—Housing under the intensive system allows $3\frac{1}{2}$ to 4 square feet of floor space for each bird; under the free-range system 2 square feet are sufficient.

of the wind by guttering being placed on the rafters, which extend beyond the back wall, but further protection for the birds from cats, &c., should be made by netting this space.

The Site.

Site of House.—In commencing to erect a building upon the intensive system, it being a large building and of a permanent nature, the site chosen must receive due consideration, and, as many poultry raisers start in a small way, provision should be made for extensions.

In addition to the foregoing, although it is recommended that the floor be concreted the position chosen should be well drained, and, if the building is to be erected on relatively flat country, the floor should be raised several inches above the surrounding country, and well rammed to provide a solid foundation.

Aspect.—The house should face north or north-east. A northerly aspect permits of the maximum penetration of the sun's rays into the house during the winter, when it is desirable, and the minimum during summer; also a good deal of our continuous rains come from a south-easterly direction.

BREEDS.

Commercial poultry may definitely be grouped in three classes, viz.:—

Light Breeds.

Light breeds are usually breeds developed extensively for egg production with little or no attention being paid to table qualities. This class of bird may also be classed as a non-sitter. Among many strains individuals will be found in which the broody trait has not been bred out, but taken collectively they may be classed as non-sitters. Another character of the light breeds is that they are layers of white-shelled eggs.

Among this class Leghorns predominate, with probably the Ancona being the next most popular, followed by the Minorca.

Heavy or Dual Purpose Breeds.

Breeds of this class have been developed for table and egg-producing qualities. Taken as a group they are not as efficient egg producers as the light breeds, but individuals of this class hold the record as egg producers in this State, namely, 354 eggs in 365 days. Without exception all heavy breeds are very docile, whereas light breeds are of a more or less nervous disposition. Breeds of this class may also be referred to as sitters. Every effort is made to breed this characteristic out, and it has been done to some considerable extent by many breeders, but in the best of flocks broody hens will be found. The egg of this class should be brown in colour, although many pale eggs will be found in all breeds.

The most popular breed of this class is the Australorp. The Langshan is probably the next in favour, followed by the Wyandotte, Rhode Island Red, and Sussex.

Game Class.

This is essentially a table class. Although it may not prove profitable to breed Game fowls for table purposes, if it is found commercially sound to breed birds exclusively for the table the crossing of any dual-

purpose fowl with the Game will add wonderfully to the table qualities of the progeny. This appears to be the most profitable manner to utilise the Game fowls.

Among the Game class is the Old English, Indian, and Australian Game.

STANDARDS.

In order to maintain breed characteristics it is essential to have standards to which to breed. Thousands of fowls are bred yearly by producers with little or no consideration being given to type. The departure from type may be attributed in some degree to the exaggerated specimens at times seen on the show bench, and to greater consideration being given by judges to feather markings than to types and egg-producing qualities.

From the one breed in many instances there has been developed two types, namely the standard-bred fowl and the utility-bred fowl. In trying to perfect his bird from a show point of view the fancier sacrificed egg qualities, while the egg producer in the race to produce eggs sacrificed type. The egg producer sacrificed type to such an extent that commercial breeders years ago drew up a utility poultry standard to be read in conjunction with the standard of perfection as laid down by the Poultry Club of England.

This move has proved of great advantage to the industry, in so far as the improvement in type that has taken place has materially assisted in maintaining the health and stamina of the flocks.

THE WHITE LEGHORNS.

The Cock—General Characteristics.

Head.—Skull fine; beak stout, the point clear of the front of the comb; eyes prominent; comb, single, perfectly straight and erect, large, but not overgrown, deeply and evenly serrated, the spikes broad at their base, extending well beyond the back of the head and following,

Plate 6.
White Leghorns.

without touching, the line of the head, free from "thumb marks" and side spikes; face, smooth; earlobes well developed and rather pendant, equally matched in size and shape, smooth, open, and free from folds; wattles long and thin.

Neck.—Long, profusely covered with hackle feathers.

Body.—Wedge shaped, wide at shoulders, and narrowing to the root of the tail; round and prominent breast; slightly rounded back sloping to the tail; large wings tightly carried and well clipped up; moderately full tail at an angle of 40 to 45 degrees from the line of the back.

Legs.—Moderately long; shanks fine and round; flat shins objectionable; and free from feathers.

Toes (four).—Long, straight, and well spread.

Carriage.—Sprightly and alert.

Weight.—Not less than 6 lb.

THE AUSTRALORP.

Queensland standard, as adopted by the Australorp Society, the National Utility Poultry Breeders' Association (Queensland Branch), and the United Poultry Club of Queensland.

Plate 7.
Australorps.

Head.—Medium in size; skull fine with no fullness over the eyes; beak of medium length, strong and slightly curved; colour, black—5 points.

Eyes.—Full, prominent and expressive, dark brown iris, the darker the better—5 points.

Comb, Wattles, and Lobes.—Medium size, smooth and fine in texture; bright red in colour; comb erect, evenly serrated and following the curve of the head; wattles neatly rounded; lobes well developed—5 points.

Face.—Bright red, fine, not sunken, and as free from feathering and wrinkles as possible—5 points.

Neck.—Medium length; slightly curved and profusely feathered.

Body, Skin, and Abdomen.—Body deep, broad backed and of good length, breast of medium depth, broad and nicely rounded, keel straight and of moderate length, the whole giving a well-balanced appearance; wings well formed and carried close to body; skin, white, texture of finest quality. The abdomen to be elastic and full but avoiding indications of excessive fat or abdominal weakness—35 points.

Tail.—Medium length, angle about 35 degrees in the male and 20 degrees in female—5 points.

Legs.—Medium length, strong and wide apart; shanks fine in bone and scale, free from feather or fluff; toes straight and well spread; legs and upper portion of feet slate to black; sole of feet white—5 points.

Plumage.—Soft, close, avoiding fluff and looseness; colour black, with green sheen—7 points.

Condition.—As indicated by general health, cleanliness of feathers and legs—10 points.

Carriage.—Erect and graceful—that of an active bird—10 points.

Weight.—Cockerel, 7 lb. to 8 lb.; cock, 8 lb. to 9 lb.; pullet, 5 lb. to 6 lb.; hen, 6 lb. to 7 lb.—5 points—Total, 100 points.

Disqualifications.—Side sprigs, any deformity.

Serious Defects.—White in lobes.

WHITE WYANDOTTE.

The Cock—General Characteristics.

Head.—Skull short and broad; beak short and well curved. Eyes large and bright. Comb rose, firmly and evenly set, low, square-fronted, gradually tapering towards the back and terminating in a well-defined spike (or leader) which should follow the curve of the neck without any upward tendency; the top of it oval and covered with small rounded points, the side outline being convex to conform to the shape of the skull. Wattles of medium length, fine and well rounded.

Neck.—Of medium length, abundantly covered with hackle.

Body.—Short and deep, with well-rounded sides; broad round breast with straight keel; short back with full and broad saddle rising a concave sweep to the tail. Wings of medium size, well folded; tail well developed, spread at the base, the main feathers carried rather upright, the sickles of medium length.

Legs.—Of medium length. Thighs well covered with soft and webless feathers, the fluff full and abundant. Shanks strong, fine, well rounded, and free of feather or fluff. Toes (four), straight and well spread.

Carriage.—Graceful and well balanced, somewhat resembling the Brahma.

Weight.—Not less than 8 lb.

The Hen—General Characteristics.

The general characteristics are similar to those of the cock, allowing for the natural sexual differences.

Weight.—Not less than 6 lb.

Colour.—Beak, bright yellow (except Buff Laced, yellow or horn tipped with yellow; Columbian, yellow or horn; Gold Laced, Partridge, Silver Laced, and Silver Pencilled, horn shading into or tipped with yellow). Eyes bright bay. Comb, face, wattles, and earlobes, bright red. Legs and feet, bright yellow.

Plumage.—In white variety, pure white, free from yellow or straw tinge.

Principal Varieties.—White, Columbian, and Silver Laced.

Scale of Points.—The White: type, 25; colour, 25; size, 15; head, 15; legs, 10, condition, 10.

Plate 8.
White Wyandottes.

Utility Poultry Standard.

Type; colour (plumage and lobes); legs and feet (colour); condition—health, furnishing brightness and cleanliness of feather and legs; in accordance with the accepted standard of the breed.

Laying Characteristics, any Breed.

Conformation—

(*a*) Length, depth, width, proportionate to type of breed.

(*b*) Length as taken from base of the neck to base of the tail.

(*c*) Depth to be determined by the vertical space between the back and the breast-bone and the pelvic bones.

(*d*) Width as measured across the saddle and immediately behind the wings as is indicated by the distance apart of the legs.

Plate 9.
A Pen of White Leghorns.

Freedom from Coarseness—

(*a*) Shanks strong, as differentiated from either extreme coarseness of bone.

(*b*) Pelvic bones strong at base; long, fine, and straight.

(*c*) Tissue—pelvic bones to be free as possible from gristly covering.

Head.—Finely modelled; skull deep over eyes, full and round at back.

Eyes.—Full, bright, and expressive.

Face.—Bright, lean, free from feathering, and not sunken.

Comb and Wattles.—Neat, fine in texture, and medium size, avoiding "beefiness."

Neck.—Fine and fairly long.

Skin and Abdomen.—Texture of skin to be of the thinnest and finest quality and pliable; abdomen to be elastic, avoiding sagging-in, or fullness indicating excess of fat.

Plumage.—Feathers soft and silky, close, but not hard as in game; fluff moderate.

Weights.—Light breeds, ½ lb. to 1 lb. above minimum, and heavy breeds 1 lb. to 1½ lb. above two score maximum points; if in excess to be cut correspondingly.

Minimum Weights.

Light Breeds.

Leghorns, Minorca, Andalusians, Spanish, Campines, Buttercups, Anconas: cockerel, 5 lb.; pullet, 4 lb.

Hamburg: cockerel, 4 lb.; pullet, 3 lb.

Heavy Breeds.

Orpington, Plymouth Rock, Rhode Island Red, Sussex: cockerel, 7 lb.; pullet, 5 lb.

Langshans, Wyandottes: cockerel, 6 lb.; pullet, 4½ lb.

Any other variety: cockerel, 7 lb.; pullet, 5 lb.

Scale of Points.

Standard Points.—Type, maximum points, 20; colour (plumage and lobes 7); legs and feet (colour), 3; condition, 5.

Laying Characteristics.—Conformation (indicating stamina and capacity), maximum points, 20; freedom from coarseness, 5; head, 7; eyes, 7; face, 6; comb and wattles, 5; skin and abdomen, 5; plumage, 5; weight, 5; total 100.

Disqualification.—Under weight, wrytail, any indications of impurity of breed, dubbing, and faking.

CULLING.

With the best of stock unprofitable birds will be reproduced, and culling has to be resorted to. By the removal of such birds the cost of production is reduced, and greater accommodation is available for the stock retained.

In Egg Laying Competitions an average of 200 or more eggs per bird is usual. This average is not impossible for the poultry raiser to obtain from a flock of well-managed pullets. However, in the second year of a bird's life production is much lower than in her first. Some excellent first-year producers may be exceptionally poor in their second. A similar relationship exists between the production of second and third year, but with the difference that third-year birds invariably do not lay a sufficient quantity to warrant their retention.

Culling, therefore, in the first instance revolves around the disposal of old hens. This being the case, it is essential that there should be some means of identification. Identification may be secured by banding birds or by toe-marking. With the latter system it is necessary to catch and inspect the feet of the bird to determine its age.

In addition to culling upon an age limit all obviously unfit birds, from chickens to the oldest hens, should be removed from week to week. The main culling should be practiced in the summer.

Plate 10.

THE HEAD OF A GOOD LAYER.—Note the alertness of appearance and freedom from coarseness. The bald head is frequently associated with high production.

Before culling the conditions under which birds have been housed and fed should be considered. Only well-treated birds can have the external features of a good layer. If the treatment has not been correct this should be remedied, and the birds given at least 6 weeks to respond.

Flocks that have been well managed and regularly culled require little culling during the summer apart from culling on age. In poorly managed and bred birds considerable culling is necessary. Hens that have given two years' production should with few exceptions be culled on age.

A good grounding of the type of the particular breed to be culled should be gathered. The bird should be examined on the ground first. A good producer should be bright, alert, and active. Those not possessing these characteristics should be removed. Good producers should have length, width, and depth of body. All small undersized birds, although of active appearance, should be removed. This work is best conducted in the house. The birds should be caught by means of a fish landing net. The balance of the birds should be handled. The catching of these is best done by rounding up in corner of house by means of a piece of 6 ft. netting, enclosing 20 to 30 at one time. In the further examination it must be borne in mind that a moulting bird will not have the same measurements as a laying hen. On handling the birds first the weight should be noted. A good producer will be lean but not light. Exceptionally light birds should be discarded. The following examination should then proceed:—

GOOD LAYER.	POOR LAYER.
Comb (hen not moulting).	
Full, smooth, red, and waxy	Limp, small, covered with white scale
Head and Face.	
Lean, fine bone, inclined to length, smooth face	Coarse—Heavy bone, short, dull, and wrinkled face
Eye.	
Full, bright, and prominent	Dull—Small and sunken
Beak—Yellow-skinned Birds.	
White or bleached	Yellow or yellow at base extending to tip
Eye-ring—Yellow-skinned Birds.	
White or bleached	Yellow
Neck.	
Medium length—Fine, avoiding excessive length	Coarse—Short, bully
Back.	
Flat, long, wide—Width extending to tail	Rounded, narrow, especially at tail
Body.	
Long—Deep both front and rear	Short—Shallow, especially at rear of bird
Legs.	
Medium length, fine bone, small close scales, toes well spread	Short and excessively long coarse, round bone
Feathering.	
Soft and close; when hand placed on bird it will not sink. Good layers frequently bald around head	Loose, soft, excessive fluff
Vent (Yellow-skinned Birds).	
White, large, soft, moist, oval, upper part overhanging	Yellow, small, hard, dry and round,
Pelvic Bones.	
Thin, pliable, and relatively wide	Thick, blunt, and close
Abdomen.	
Loose, skin pliable, soft, full when in lay and deep from pelvic bones to keel	Tight, hard, tucked up, pelvic and kee bones close
Moult.	
Late and rapid, many laying and moulting.	Early—Slow

FEEDING FOR EGG PRODUCTION.

The laying fowl has first to provide from her food supply for—

(1) Maintenance of vital functions;

(2) Growth requirements; and

(3) The production of eggs.

The first call upon the food supply is that for the vital functions, then growth, and any surplus nutrients used in the manufacture of eggs. It will therefore be seen that the greater the production the greater will the consumption be, and that egg production is only possible by feeding quantities of food in excess of body requirements. It is generally estimated that a hen in full lay will consume approximately 2 ounces each of grain and mash per day. This quantity, however, will be in excess at times, and again be deficient during the period of peak production.

The majority of cereal foods available are generally deficient in protein, and in preparing a ration it is necessary to use protein-rich foods in the form of milk, milk powders, and meat meal. Protein-rich vegetable foods are available, but it has been found from experience that animal proteins give better results than vegetable. This probably is due to their greater palatability and to the fact that the range of animo-acids is wider. From practice it has been found that rations having a total protein content of 15 per cent. give satisfactory results. As protein-rich foods are the most costly, it will readily be understood that the object of the feeder should be to use the minimum quantity necessary for maximum production.

The poultry raiser who does not desire to prepare his own ration may purchase laying mashes to be fed in conjunction with grain, also all-mash. These laying mashes have approximately 18 to 20 per cent. of crude protein, and when fed in conjunction with grain, say equal parts of maize and wheat, the total crude protein content of the ration is reduced to the vicinity of 15.5 per cent.

In addition to the protein and carbohydrate, the mineral content of the layers' ration has to be taken into consideration. The average amount of carbonate of the egg shell is one-fifth of an ounce. To supply the requirements, say, in the mash, 4 per cent. of calcium carbonate would be necessary, but as hens not laying would only void the material it is a better practice to have shell-forming material in the nature of limestone and shell grit always before the bird in separate receptacles.

Commercially, yolk colour does not appear to have been given much consideration, but the consuming public do not like an excessively pale-yolked egg, and, to overcome this, green feed and yellow maize should form a definite part of a laying ration. Both foods are rich in vitamins, and green feed materially assists in supplying the mineral requirements of poultry. In the absence of green feed lucerne chaff or meal should be used.

The manner in which layers may be fed varies. The most popular at the present time is the feeding of dry mash and grain, although all-mash is coming more into vogue. For those who desire to prepare their own mixture the following rations are suggested as a working basis:—

RATION—GRAIN AND MASH.

Mash.	Per cent.	Grain.	Per cent.
Lucerne chaff or meal	10	Wheat	50
Bran	28	Maize	50
Pollard	30		
Maize meal	20		
Linseed	2		
Meat meal	10		

Supplements to each 100 lb. of mash—

½ lb. Salt.
2 lb. Bone Meal.
1 per cent. Cod Liver Oil.

All Mash.

	Per cent.
Meat meal	5
Lucerne chaff	6
Linseed	1
Maize meal	30
Bran	20
Pollard	40

Supplements—

Bone meal	2 lb.	To every 100 lb. of Mash.
Salt	½ lb.	
Cod liver oil	1 lb.	

REPLACEMENT OF FLOCKS.

As previously mentioned very few hens are retained for egg production beyond a period of two years. This, coupled with the constant culling that takes place on a well-conducted farm, and the normal mortality necessitates the replacement of approximately 60 per cent. of the flock each year, which is a big problem to the general farmer.

It is little use replacing old and culled hens if such replacement is not made with birds that will be better producers.

This replacement may be made by the agricultural producer selecting and mating the best of his birds, by the purchase of eggs for hatching purposes, or by the purchase of day-old chickens.

Efficient breeding is only possible by a close association with the birds in order to obtain records of production, and the necessary ability of effectively selecting for stud purposes birds that will give satisfactory results. This close association is a factor that on the average farm is an impossibility, and it therefore appears as if the most sound practice of replacement would result in the purchase of day-old chickens.

The expansion that has taken place in the poultry industry has brought with it modern equipment that permits of day-old chickens being turned out by the specialist breeder at a price at which the small flock owner could not produce his own. There are operating in this State incubators of the capacity of 16,000 eggs. These machines are working at full pressure for at least three months in the year and they make it possible for breeders to specialize in the production of chickens for sale.

Hatcheries of such a nature make it possible for the farmer to replace his flock with chickens hatched during the most suitable period of the year. They relieve him of the necessity of selection, mating, and incubation on his own farm, and if the chickens are secured from a reputable source insure him of maintaining a profitable flock.

INCUBATION.

Incubation can be successfully conducted throughout the year. However, the most profitable period in which to hatch chickens is from June to September. Chickens hatched later do not thrive and are more susceptible to disease. Ducks can be profitably hatched at any period where cheap foodstuffs prevail.

Eggs must be carefully selected for incubation purposes for size, shape, and texture of shell. It is important that only eggs which exceed 2 ounces in weight be incubated in order to maintain a good commercial

product. Misshapen eggs should be rejected. Eggs having porous or thin shells allow the contents to evaporate resulting in poor hatches. If eggs for incubation are to be kept longer than one week they should be turned daily; by this process they can be kept for three weeks. Fertile eggs must be stored in a cool place free from draughts.

Periods of Incubation.

The recognised periods of incubation are:—

Hen eggs, 21 days; Guinea fowls, 26; English ducks and Geese, 28; Turkeys, 30; Muscovy ducks, 35.

Natural Incubation.

With natural incubation difficulty is always experienced in having hens broody at the right time. When setting a broody hen the nest should be made comfortable and darkened. The bird should be dusted with insect powder before the eggs are placed under her and again before the hatch comes off. After setting she should not be disturbed for 36 hours, but should then be brought off for food and water. She must come off daily for food, water, and must have a dust bath. The hen must be fed on whole grain.

Artificial Incubation.

Instructions are supplied with incubators. These should be followed by the operator.

Housing.

An incubator should be housed in a well ventilated room having an even temperature. Underneath a residence which is on high blocks would make an ideal incubator room. The incubator must be level and stand firm on the ground.

Management.

The machine should be washed and disinfected after each hatch, using Izal or some such germicide in the water The lamp should be filled and the wick and burner trimmed daily; an old tooth brush could be used to clean the wick.

Beginning of Hatch.

The machine should be heated up for at least a day prior to putting in the eggs, so as to regulate it and have the temperature even at 102 degrees with the bulb of the thermometer level with the top of the eggs. The eggs should be set in the morning. The thermometer should be tested for accuracy at the start of the season.

Turning and Cooling.

After having been set, the eggs should be left alone for 36 hours after which they have to be turned twice daily to the 18th day. The eggs have to be cooled every day commencing with 5 minutes the first, increasing the period to 10 and 20 minutes during the second and third weeks.

Testing.

It will be necessary to remove infertile eggs also dead germs during the hatch. This is best done on the 7th and 18th days.

Ventilation and Moisture.

The greater the ventilation the more moisture is required. If there is very little ventilation in the machine, the machine could be successfully operated without moisture.

BROODING.

The artificial brooding of chickens is a difficult process with an inefficient plant. The object of the breeder is to keep the chickens warm and comfortable and to wean them from heat as quickly as possible.

Systems of Brooding.

Two systems of brooding are in common use in the State, namely what is known as cold brooders and heated brooders. In both systems many types of brooders are used.

Cold Brooders.

The term cold brooding is a misnomer. Artificial heat is not supplied, but the heat of the body of the chicken is retained by means of cloths or flannel and a restricted circulation of air. This system of brooding has been practised for many years, but it is only in comparatively recent years that it has been used to any great extent by commercial poultry farmers. The illustration of the cold brooder will convey the nature of their construction. The cold brooder can be operated in brooder houses or rearing pens with an equal degree of success. Although the writer has operated the cold brooder with apparently equal results to the heated brooder, the latter is favoured. It can well be understood that the placing of chickens that have travelled a day or so under a cold brooder, which has to be warmed up with their own bodily heat will not be attended with as good results as would be the case if they were put under a heated brooder. Also that in cold bleak weather the heated brooder would offer advantages above that of the cold.

Heated Brooders.

There are many types of heated brooders, but they can be referred to as the box and the colony. The former system is not used to any extent in this State. This in the first instance may be due to the cost of installation of a suitable type and secondly to the general satisfactory results from the colony system.

Colony Brooder.

Where large numbers of chickens are to be reared the colony brooder appears to be the most economic and as effective as any other type. With this class of brooder several hundreds of chickens can be run together with little more trouble and attention than would be required for a lot of a 100 under any ordinary brooding system. This system also permits of a very much freer movement of chickens once they have been educated as to the source of heat and assists in the retention of that keenness in life that is essential to health and growth.

Five hundred chickens should, however, be the limit in any one colony brooder, but possibly 100 less would give better results. It is also generally a sound rule to depreciate the capacity claimed for brooders by most manufacturers.

Plate 11.

A SAWDUST-HEATED COLONY BROODER.—Showing fire bucket filled with sawdust which is fitted into the cylinder on right. Note core in centre of bucket for draught.

The colony brooder consists of a heater with a metal hover for the purpose of deflecting the heat. The fuel used may be coke, sawdust, kerosene, or electricity. Whatever type of colony brooder is used it should be housed in a special brooder house. It is possible to operate them in open-fronted houses by cutting off ground draughts but it will be readily understood that when such is the case considerably more fuel is used. In the case of kerosene and electricity-heated brooders the increase in the costs of heating in open-fronted houses would be considerable. With the sawdust and coke brooders costs are not excessive, but the great disadvantage operating in open-fronted houses is to keep the heat at a uniform temperature. It is found in practice that they will burn out within a period of 12 hours and in some cases less with the consequent chilling of the chickens.

A suitable sized building to house a 500 colony brooder would be one that measured approximately 14 feet by 16 feet and was at least 6 feet high. The roof may be either a hip-roof or skillion. The building should be lined and ceiled and provided with ample light. It should be built to face north-east or north and arranged so that the sunlight can be freely admitted. Lighting through glass is desirable in bad weather, but direct sunlight is essential to admit of the ultra-violet rays. Failing this, cod liver oil is an essential to all chicken-mashes, in order to supply Vitmin D. A few weeks of brooding without sunlight or cod liver oil would soon result in leg weak chickens. Sunlight is the cheaper.

The house may be built of timber or iron. Iron is to be preferred, being of a more lasting nature and offering less harbour for vermin. The lining and ceiling should, for preference, be of $\frac{5}{8}$-inch tongue and grooved pine, but for economy wheat sacks sewn together and white-washed will serve. The floor should be concreted and a thin concrete wall sunk into the ground to a depth of 18 inches. This wall prevents rats burrowing under the floor, while the concrete floor is readily cleaned.

Temperatures.

In heated brooders temperature is a very important factor. If insufficient heat is supplied the chickens crowd together. The correct heat is the only method by which this can be prevented. Overheating is also to be avoided on account of its weakening effect and the difficulty that will be experienced in weaning from the brooders. The general comfort of the chickens is a sure index that the temperature is fairly satisfactory, and if the droppings are well distributed under and around the hover in the morning, it is proof that the chickens have been fairly comfortable. When the chickens are first put into the brooder they come from a nursery in the incubator which generally has a temperature of at least 90 degrees and it is as well to start your brooders at this temperature, gradually reducing it until heat can be dispensed with in from 4 to 6 weeks.

Ventilation.

With some types of brooders many chickens are lost through lack of ventilation and over-crowding. Brooders which are usually made to hold a 100 day-old chickens are generally too small for the same number of chickens a week old. It frequently happens also that the attendant makes no allowance for additional ventilation with the growth of the chickens, and, although he has been successful in rearing them to the age of one week, they then start crowding and dying. The lack

of ventilation has a great weakening effect on both young and old stock. It causes the young to crowd, and renders the older birds more susceptible to disease. When chickens have crowded they present a wet appearance in the morning, to which the term "sweating" is applied. Sweating is not the cause. The wetness is caused by the condensation of the moisture content of the breath which would have been carried away if proper ventilation had been provided. Chickens which have been overcrowded rarely recover from the ill-effects, and it should be avoided at all costs.

In brooding under any system the following are the essential points:—

(1) Limited range, increasing with age.

(2) Sufficient heat, which should be reduced as early as possible.

(3) Ventilation, which should increase with age.

(4) Correct accommodation. What is just enough room for 100 day-old chickens rapidly becomes too little as they grow.

(5) Never attempt to brood chickens of mixed ages.

Placing Chickens in Brooders.

When chickens are placed in brooders the floors should have a light dressing of sand or soil to absorb any excreta and to give the chickens a good footing. A small amount of litter in the nature of soft straw or chips will provide exercise and tend to keep the chickens active.

With both hot and cold brooders their liberty should be restrained for a start. This can be done by erecting a barrier of wire netting around the brooder, increasing the area day by day. At the end of about one week they can be given the liberty of the brooder house. With the cold brooder the netting should only allow a range of two or three inches for the first day. With the colony brooder the range will depend upon the heat given off by the brooder.

What is necessary is to educate the chickens as to the source of heat. When this is done to encourage them to take as much exercise as possible by ranging over the floor of the entire brooder house.

Most breeders have outside runs to their brooder houses and the chickens are allowed out in them after they are about a week old. Outside runs are not essential if the brooder house is constructed to permit of abundance of light and sunshine. However, when runs are provided the chickens should be driven in after they have been out for an hour or so upon the first occasion.

They may be allowed out again in the course of an hour or so. This should be repeated in order that the chickens will learn to return to the brooder house and avoid to a large extent the possibility of their being caught out in a rain storm or staying out too long and becoming chilled.

Sanitation.

Cleanliness in every operation is essential. Insanitary conditions not only pollute the atmosphere of the brooders but are frequently the cause of the rapid spread of serious diseases in baby chickens. In very young chickens Bacillary White Diarrhoea is responsible at times for heavy mortality. The chickens are very subject to this disease within the first ten days. The organism responsible is voided in the excreta,

Plate 12.
Cold Brooders.

consequently it will readily be understood that a few diseased chickens could be responsible for the spread of the disease among the whole brood. This fact emphasises the advisability of the destruction of apparently sick chickens and the regular and frequent cleaning of brooders.

Coccidiosis, another disease to which chickens are subject, is spread through the medium of the droppings. With the former disease some affected chickens are the result of affected parents and when hatched are already diseased. With coccidiosis the chicken contracts the disease after hatching. Many adult birds are affected with coccidiosis. The organism is therefore easily carried upon the feet of the person attending them to the brooders. Strict sanitation and the application of precautionary measures gives reasonable assurance of protection against the disorder. Brooder houses should be cleaned out every second day and the sleeping quarters daily.

Weaning.

When chickens are from 4 to 6 weeks old it is generally necessary to remove them from the brooders to make room for others. This is also necessary to protect the soil from becoming too foul and the chickens too soft by prolonged supply of heat. Correct brooding will materially assist the weaning process as the heat should have been gradually reduced.

The chickens were trained in the early stages of brooding and training again is essential. Poultry are largely creatures of habit and can generally with care be trained to act as required. When once they form a habit—good or bad—it is difficult to alter. A little time spent in seeing that chickens take to their new quarters during the first few nights will amply repay the poultry keeper and prevent losses that occur when growing chickens crowd into corners, etc.

Chickens may be placed in permanent laying quarters or colony houses when they are to be weaned. The permanent house may be an intensive laying shed or a special colony house. The colony house is an ideal system provided that it is situated on clean land, and that the colony is not contaminated with the droppings of adult or diseased birds.

The number to be put out together, of course, varies with the accommodation available but larger flocks than 100 are not recommended; 50 would be safer.

A good rearing house for 100 chickens should be at least 10 feet long and 8 feet deep—this, of course, with free range. The house should be 5 feet high at back and 6 feet high in front. Ventilation should be provided by leaving a space between the top of the back wall and roof of three inches. As a protection from the south-easterly weather at least four feet of the eastern front end should be covered with iron. The front should be netted and provided with a gate in order that the birds can be shut in over night as a protection from foxes, etc.

General Management.

When the chickens are taken from the brooder quarters and placed in houses to be weaned they are too young to perch of their own free will. Various arrangements have to be made to prevent crowding. Some breeders bed them down on straw. The straw needs to be fairly

deep and loose and well heaped up in the corners of the house. The chickens appear to be content to snuggle in the straw instead of making warmth by crowding together. It is then only necessary to go around in the evening with a fork and loosen the straw up. In the shaking the droppings fall on to the floor and are readily cleaned up. With this system of weaning perches must be erected later and the birds allowed to take to them at will.

Another system of weaning, and one that educates the bird to perch at the same time, is to erect a wire netting platform about 6 inches from the ground with a netting run up. On the top of this frame several strips of 2 x 1 timber are attached. The chickens at night are not allowed to rest anywhere but upon this platform. They certainly crowd together for a start but soon spread out. The netting allows for a circulation of air and they experience no ill-effects. It is necessary to watch the chickens for the first few nights; but immediately they have settled down they can be left.

In erecting this platform it is essential to make it the full width of the house and to place it at the closed end.

The chickens as they develop must be thinned out. No hard and fast rule can be laid down as to when this thinning out should be done, as the work is dependent upon the space available.

THE FEEDING OF CHICKENS.

In the feeding of chickens it is most important to bear in mind that nature has provided for the first day or so of the chickens life, as, just prior to hatching, the balance of the egg yolk is drawn into the abdomen of the chick. Most breeders allow at least forty-eight hours to elapse before feeding. Chickens fed earlier are subject to bowel trouble. Prolonged starving, however, should not be practised, as it has a weakening effect, from which many chickens do not recover.

Requirements for Growth.

Chickens make very rapid growth in the early part of their life. This development is most rapid during the first six to eight weeks, consequently rations having a relatively high protein content are necessary to give the best development. From experimentation it has been fairly definitely established that rations having a crude protein content of 20 per cent. should be used during the first six to eight weeks, and after that period should be reduced to 15 per cent. The protein requirements of a chicken do not alter as sharply as is suggested, but these periods and protein content are suggested as meeting the practical needs of the poultry raiser.

It is a common practice among poultrymen to cut down the protein content after the chickens are about sixteen weeks of age, in order to delay sexual development. This is desirable if the birds are maturing too rapidly, but development can be controlled to only a very limited degree. Excessive protein feeding must be guarded against, as it is likely to cause deposits of urates in the ureter, kidneys, and other organs, as well as placing an undue strain upon the liver.

It is generally conceded that milk is the most desirable protein feed for chickens and growing stock, but owing to its cost its exclusive use is not possible. Wherever possible milk should form a portion of the ration. It may be given in the form of curds, semi-solid milk,

butter milk, or butter milk powder. As a drink milk is excellent, but it is objectionable owing to the difficulty of keeping chickens clean. Butter milk powder is suitable, owing to the ease with which the powder may be incorporated in the mash, thereby controlling the kind of food that each chicken consumes. It has, however, no definite advantage from a feeding value point of view apart from its concentration. Proteins build up the flesh, but at the same time a bony framework is necessary. Analysis of the chicken at different ages, according to Halman, indicates that it was particularly important to allow for the mineral requirement from the eleventh to the twenty-fourth week. In all experiments conducted by the Department, the increased mineral intake has been allowed for by the addition of bonemeal to the mash at eight weeks of age, and by allowing the birds free access to grit (shell and hard).

Food Consumption of Chickens.

One is often asked how much food should be given to chickens. Probably no better reply can be given than the publishing of a table from actual experiments conducted in this State.

FOOD CONSUMPTION AND WEIGHT OF CHICKENS.

Age.	Leghorns.		Australorp.	
	Weight of Chickens.	Food Consumed.	Weight of Chickens.	Food Consumed.
	oz.	oz.	oz.	oz.
Day old	1·3	..	1·36	..
1 week	1·97	1·64	2·14	1·53
2 weeks	3·31	3·36	3·61	3·32
3 weeks	5·31	4·80	5·84	5·05
4 weeks	7·61	6·46	8·68	7·20
5 weeks	9·94	7·58	12·08	6·89
6 weeks	12·92	8·96	15·86	10·62
7 weeks	16·65	8·65	20·17	13·95
8 weeks	20·41	13·29	25·31	15·05

The variation in weight from week to week and the ever-increasing amount of food required suggests the undesirability of indicating what should be supplied.

The food requirements increase week by week, and a system of feeding where the growing birds may consume all they require is the most desirable.

The all-mash method of feeding chickens by reason of the fact that the kind of food consumed is easily controlled, and that it is always in front of the birds, is suggested as being the most desirable. All-mash should be placed in shallow trays about 1 inch in depth during the first few days. The trays are then increased to a depth of 2 inches, and by the end of the first week troughs about 4 inches wide may be used. At this age chickens will commence to scratch, scattering the feed from the trough. This can be prevented by placing a piece of netting on top of the mash loose enough to sink as consumption takes place. During the first week 8 feet of feeding space should be allowed for every 100 chickens, and later increased to 12 feet. Prior to the mash being covered with netting it is important that only a little food at frequent intervals should be placed in the trays in order to avoid wastage.

In fact, the frequent feeding of all-mash appears to induce a greater food consumption, with the result of better development.

Breeders who do not desire to feed an all-mash could make use of commercial chick grains and growing mashes. These could be fed as directed by the manufacturers. It has been the general custom for many poultry raisers to use scratch grain only for a short period of a chicken's life, but in the view of the more satisfactory results obtained by feeding a ration of a relatively higher protein content than chick mixtures usually have, early mash feeding appears essential.

Chickens may be reared satisfactorily upon moistened mashes and grain from about two weeks of age, but the mashes must be fed at frequent intervals. This system offers the advantage of utilising milk as a medium of moistening the mash when such is available. The feeding of dry mash, however, is suggested as a safer method of feeding, as the possibility of food becoming sour, with the probable consequence of bowel trouble among chickens, is avoided.

Suitable All-mash Mixture.

The following mashes have been used successfully in experiments conducted by the Department, and are suggested as a basis upon which to work. At times it may not be commercially sound to stick hard and fast to the ingredients suggested, but from the table of analysis supplied it will be possible for the breeder to compound other suitable mixtures.

Ration.	1–8 Weeks.	8 Weeks to Maturity.
Maize Meal	56	63
Bran	12	13½
Pollard	12	13½
Meat and Bone Meal	6	5
Dried buttermilk	14	2½
Salt	1	1
Cod Liver Oil	1	1
Lucerne Meal	..	2½

FARM FACTORS INFLUENCING MARKETING.

The question of marketing has to be considered in relation to—(1) the egg, (2) table birds, including birds specially reared for table purposes, stock that have ceased to be profitable, and young males, and (3) poultry manure.

The latter product is not of great importance at present, as the demand for it is very limited, and in many instances it is found more profitable to use it as a fertiliser for the growing of green feed than to sell it. At the best sales possible, it little more than covers the purchase price of material used for scratching purposes.

Marketing, particularly in the first stage, is most certainly a function which definitely concerns the individual poultry-keeper. It is not merely the task of the Egg Board or the commission agents. The poultry keeper considerably influences the ease of marketing by the retention of the quality of the egg. If every consideration is not given to the preservation of the quality of the egg as laid, the task of marketing is made most difficult. Producers should therefore remember that the earlier the egg reaches the consumer after being laid the better.

The principal factors influencing successful marketing are:—

(1) The production of unfertile eggs.

(2) Clean and ample supply of nests. (Eggs when laid are moist, and dust and other matter readily adhere.)

(3) Gathering at frequent intervals to prevent eggs becoming soiled.

(4) Collecting in clean and dry receptacles.

(5) Storage (pending marketing) on the farm in cool quarters free from draughts and foreign odours.

(6) Regular and frequent despatch to market—twice weekly during warm weather; once weekly during winter.

(7) Using dry, clean fillers, and cases free from moulds when packing for market.

Egg production has outstripped the local consumption at present, and producers must make every effort to encourage a greater demand by careful attention to the quality of the egg, as quality plays the most important part in demand. It is economically unsound to continue to produce eggs in excess of the ability of the market to absorb them.

The basis of the poultry industry is egg production, for which breeds such as Leghorns, utility Orpingtons, &c., are bred, the former variety predominating. Under these conditions the class of bird which forms the bulk of poultry sold for table purposes are young cockerels of both light and heavy breeds and hens culled on account of their age, or for other reasons which have rendered them unprofitable as egg producers.

The individual producer has to give consideration to such questions as the time of marketing, conditions of stock, grading, and crating.

Cockerels constitute possibly the majority of the birds that a producer has yearly for sale, and present greater difficulties by reason of the fact that they have to be disposed of during a relatively short period. They may be sold at various ages, each age having its special advantage. Although the majority of the buyers prefer young stock for table purposes, they will not pay high prices for small half-grown birds when larger hens are available, which would proportionately be much cheaper. Having this in view, it is not a desirable practice for the producer to send half-grown cockerels to the market and expect to receive good prices for them during the period when the great majority of our old hens are being disposed of on account of age. This period varies, but usually extends from some time in January until April. Young half-grown birds will find a ready sale from August until the Christmas season. After that period young stock should be well grown to command good prices, but not kept until they become staggy, which is indicated by spur growth.

It is necessary to give some attention to the general condition of the birds to be marketed. No good is done by sending on stock to sale-room low in condition, especially when it is considered that, in old hens particularly, there are only a few in such a state. It is not suggested that any attempt be made to fatten this class of bird, as they generally are constitutionally unfit, and the producer's ends would be better served if they were destroyed, as it may happen that these particular birds will be those examined by prospective buyers.

Cockerels, however, should receive some consideration and not treated, as they too frequently are, as an encumbrance and not worth feeding. If they are to be kept for any time at all they should be well treated and receive the same attention as the pullets; they have got to be grown, and the cheapest and quickest way of doing this is to feed them well. They require, for economical growth, the same ration as the pullets. They should be kept free from intestinal worms and disposed of as early as possible.

DUCKS.

Breeds.

Heavy—Muscovy, Aylesbury, Pekin, and Rouen.

Light—Indian Runners, Orpington, and Khaki-Campbell.

The heavy breeds are principally bred for table purposes, whilst the light breeds are bred for egg production.

Plate 13.
Ducks in natural surroundings.

Housing.

Ducks do best on well-drained land having a sandy natured soil, land having a gradual slope to the north or north-east being ideal. Houses can be built similar in design to poultry houses, a lean-to building facing north or north-east, open fronted with a ventilation space at the top of the back wall. The roof need not exceed 4 feet in height.

at the back. It is not necessary to erect expensive buildings for the accommodation of ducks. Allow 2 square feet of covered floor space for each duck. It is essential for the floor to be dry at all times; a damp floor in the duck house will cause many deaths among the birds. To ensure having dry floors, build up the floor several inches above the level of the surrounding land, and also excavate drains outside the house to prevent flooding during the wet season. A good hard earth floor is satisfactory. To facilitate cleaning, sprinkle sand over the surface. The floor should be covered with litter, such as grass or straw. Nest boxes should be provided, these to be placed on the floor against the walls. If the ducks have access to a swimming pool, it will be necessary to confine them to the house or netted run until about 9 o'clock in the morning, as by this time they should have finished laying: otherwise many eggs would be laid in the pool. A swimming pool is not essential. However, ducks keep in better health, have more exercise, are more free from external parasites, and the plumage is cleaner when they have access to a pool. Better fertility also results when water is available for swimming purposes.

Breeding.

It will be most profitable to adopt the same breeding season for light breed ducks as for poultry, namely, from June to September. Ducks hatched during those months will commence laying when egg values are high, and continue for about 12 months before moulting. Heavy breeds can be successfully bred from at any time, providing cheap foodstuffs are available. Care must be exercised in the selection of breeding stock, and particular attention must be paid to size and type. Any bird showing breed defects should be rejected. The number of females to mate with each male varies considerably with the age of the male, the size of the run, and whether the birds have access to a pool. On the average mate between six and eight females with each male, light breeds; and from four to six females with each male, heavy breeds.

Incubation.

The period of incubation is 28 days for all breeds with the expection of Muscovy eggs. These take 35 days to hatch. The incubation of duck eggs is best done with ducks. If broody hens are used, it will be necessary to sprinkle the eggs with water regularly. Also by sprinkling water on the ground close to the nest, when the hen comes off, she will dust bath, and the feathers will be moistened when she returns to the nest. The duck, however, will moisten her feathers sufficiently before returning to the nest. With artificial incubation, the temperature should be about one degree lower than that for hen eggs, namely, 102 degrees. After setting the eggs should not be disturbed for 48 hours. After this period they should be turned twice daily, and cooled daily. Each time the eggs are turned, before being returned to the machine they should be sprinkled with warm water. This sprinkling is essential, because the eggs require a lot of moisture. The eggs should be tested and infertile eggs and dead germs removed. The machine should not be opened after the ducklings commence chipping, until the hatch is complete. Ducklings take longer to break out of the shell than chickens.

Rearing.

Ducklings are very hardy and easy to rear, therefore the rearing can be carried out by artificial methods. Cold or fireless brooding will prove satisfactory. Any type of box, well ventilated, with flannel hanging down and plenty of dry straw or grass on the floor will be suitable.

However, the ducklings must not be too crowded, and they should receive more room each week, because they grow very rapidly. Ducklings are best reared in small numbers. At about four weeks old they can be placed in houses.

Feeding.

Ducklings require no food for 48 hours after hatching. During this period they should have water, coarse sand, and charcoal constantly before them. A mash that will give good results, if fed from the first meal until they are about four weeks old, is prepared by mixing together:—Pollard, 10 lb.; maizemeal, 8 lb.; dried buttermilk, 2 lb.; bonemeal, ½ lb.; fine salt, 4 oz. If this mash was mixed, the amount for each meal could be moistened as required. Feed several meals daily—a little, and often, is a good motto. After four weeks they could be fed a mash similar to that fed to the adults. Adults' mash:—

	Per cent.
Pollard	55
Bran	25
Maizemeal	10
Meatmeal	10
Bonemeal	1
Fine salt	1

Growing stock should be given three meals daily. With adults, a small meal of whole maize could be fed in the evening in addition to the mash. In fattening ducks, cheap foodstuffs in the form of potatoes, pumpkins, &c., could be boiled and added to the mash to the extent of 40 per cent. Chaffed young greenstuffs should be added, but when, other cheap foodstuffs are used, it should be omitted, as otherwise the mash would be too bulky.

Water.

Ducks must always have access to drinking water. This is most important with ducklings, and the water vessels should be deep enough for them to submerge their heads. Many ducks die annually, and this may be attributed to lack of water.

Common Ailments.

Colds:—Symptoms: Running nostrils and watery eyes; Cause: Damp camping quarters; Remedy: Keep the floors of the houses dry.

Staggers:—Symptoms: Ducklings stagger about and fall on their backs before dying; Cause: Drinking to excess, after a shortage of water. Remedy: Keep a constant supply of water before the ducklings at all times. The water vessels should be so constructed to prevent the ducklings swimming during the first week, otherwise they may get cramps. This applies particularly to cold weather.

TURKEYS.

Suitable Localities.

The farm, by reason of offering turkeys ample range, enables them to gather considerable quantities of their own food in the form of grass, insect life; and, when stubbles are available, grains. Districts in which the soil is of a light nature and undulating are more suited

to turkey raising than low-lying, wet country. Scrub country offers ideal conditions, especially where there is a good supply of green feed and water.

Housing.

It is natural for turkeys to roost in the open; but, when there is no suitable belt of timber to afford protection, certain housing methods should be adopted to obtain the best results. These houses need not be very elaborate, but should be so constructed as to permit of a free circulation of air. Old open-fronted lofty barns are well suited for this purpose, but in districts in which turkeys have to be protected from the fox it may be advisable to adopt the following system:—Enclose an area of land, about half an acre, with a 6-foot netting fence, and build a shed in the middle. This shed should face north, and be open in front with a 6-inch space between the back of the top wall and roof. The dimensions would vary according to the number of birds to be housed, but each bird should have a floor space of 15 square feet. The house should be 9 feet high in front and 7 feet at back. Perches should be about 3 feet high, all on the same level and 3 inches wide. Suitable nests could be placed around the enclosure and made to look as natural as possible with the help of bushes. The turkeys could be confined to these quarters at night, and allowed range during the day.

Breeding Stock.

There are several varieties of turkeys, but the American Bronze holds pride of place. This is a large and hardy breed, which has supplanted most other breeds and appears to be well suited to our climate as well as our markets. Mature stock should only be used for breeders, two years and over being more suited than stock only a year old. One vigorous tom (male bird) can be mated with as many as ten hens, but probably six to eight females on the average would give better results.

In selecting, strength and vigour, coupled with the knowledge that the stock comes from healthy parents, is of primary importance. The head should have a clean and healthy appearance, body compact and long. Sturdy shanks and strong toes with fair-sized bone indicating stamina.

Extra heavy show specimens do not make the best breeders. What is required is stock in good hard condition, and not fat; on the other hand, stock that are thin should never be used, as the lack of condition may be due to some inherited weakness. Hens weighing 16 to 18 lb. and male birds 25 to 30 lb. in fair condition will be found to give satisfactory results.

Inbreeding should be avoided, and new toms from healthy parents, introduced occasionally. As a further precaution these should be isolated for two or three weeks. The best hens raised on the farm should be reserved for breeding purposes.

Hatching by Natural Methods.

Vermin must be carefully guarded against, and when nesting in enclosed quarters both the hen and the nest should have a good dusting with insect powder for a start, and again a few days previous to hatching. By taking these precautions the young poults will be assured of a start in life free from vermin, which is a great aid to successful rearing. A turkey will only cover properly fifteen to eighteen eggs, and it is

a good plan to set a few eggs under broody hens at the same time as the turkey is set, and when hatched to give all the chicks to the turkey, as she can comfortably mother about twenty-five. Food, water, and grit should always be handy to the sitting hen, and if the tom is at all savage it is advisable to protect the nest and young.

Rearing.

It is found best to let turkey hens mother the chicks. When hatched, the young poults should be left undisturbed until thoroughly dry, they then may be temporarily removed to induce the turkey to remain on the nest, if it is found that the eggs are hatching irregularly. After the hatch is complete a coop which affords protection from wind, rain, and dampness should be provided. This coop should permit of a free supply of air, and be moved on to new ground daily. The hen and poults should be confined to the coop for ten days to a fortnight, but if the weather is fine the poults may be allowed a little liberty when the dew is off the grass; after this period it is generally safe to allow range, providing the grass is not too long and wet. When they have reached the age of five weeks entire liberty can be given, allowing them to roost in barns, houses, or trees, according to the policy adopted.

Feeding.

No food should be given for at least forty-eight hours after hatching. Hard grit, charcoal, and water should be the first food provided. The hard grit assists in mastication, and charcoal has no equal as a bowel corrector. Turkey chickens will gorge themselves if allowed, and this gorging is responsible for a considerable amount of trouble. Turkeys in their wild state would gather their food very slowly, and it is found best to reproduce these conditions as far as possible by only feeding the young chicks a little at a time, and fairly frequently. This prevents them from overloading their digestive organs and helps to retain that keenness of appetite which is essential to the health of the birds.

Stale bread soaked in milk and then squeezed fairly dry is the most handy food on the farm, and also gives excellent results. This can be fed five times a day for a few days, and variety can be made by the replacement of some of the meals with chick grains, mashes of bran and pollard mixed with milk, to which can be added a small amount of minced meat and tender green feed. This mash should be made crumbly and not sticky. When on range the quantities of food will vary according to what they can gather for themselves, but surplus milk can be fed at all times either thick or fresh, but it is as well to always feed it in the same condition. Green feed should be fed in abundance to both growing and adult stock, but where range is allowed on good green pasture it is not so important.

Grains should always be fed at night to induce the flocks to return to their camps. Oats, maize, and wheat are suitable for this purpose.

In the management of turkeys, especially in the rearing of young stock, cleanliness is essential. Food should not be allowed to lie about or become decomposed, and a strict outlook must be kept for vermin of all sorts.

THE GOOSE.

The farm, with the facilities for free range and an abundance of green feed, is the natural habitat of the goose. Although the keeping of geese on a large scale is not recommended, a small flock upon the farm will be found economical and profitable to keep.

There are two breeds of commercial note kept in this State—the Toulouse and the Embden.

The Toulouse.—This breed originated in France. It is grey in colour with the exception of the lower portion of the body, which is white. The bill is pale yellow and legs and feet reddish-orange. The bird is large in frame and loosely feathered, giving it a massive appearance.

The female is a fair layer and a good mother. The young are hardy and easily reared. The standard weights are—Gander, 28 to 30 lb.; goose, 20 to 22 lb.

The Embden.—This is a white goose with bright blue eyes, bill and legs of orange colour. It is a large and compact goose. The females are excellent layers and good mothers. The young goslings are very hardy and make rapid growth.

Standard weights are—Gander, 30 to 34 lb.; goose, 20 to 22 lb.

Management of Breeding Stock.

Only strong well-developed birds should be used. This is particularly important with females, and no birds under two years of age should be used for breeding. Geese form strong attachments, and consequently unless they have been running together for some time do not mate readily. The geese and gander that are to be mated should be penned together some time before the breeding season, with the object of overcoming this difficulty. One male should be used with two to four females, depending upon the age and condition of the gander.

Very little housing will be found necessary, but they must have dry bedding and shade. Breeding birds can, with advantage, have access to a pond; in fact, a pond or stream is desirable for all adult stock.

Quite a considerable quantity of the ration of adult geese can consist of green feed. If the birds have access to green pasture a little grain during the evening will be sufficient. In order to induce laying during the breeding season a mash with similar ingredients to that used for feeding laying fowls should be given.

The laying of the goose varies with individuals. A good goose may lay thirty to forty eggs while others again may only lay ten. After laying the goose covers her eggs. It is a good plan to collect these eggs daily and so try and prolong the laying period. When once the goose goes broody, she can be given ten or so to sit upon and the balance given to broody hens. A hen will cover five or six.

Some breeders make a practice of taking away the young goslings as they hatch, owing to the slowness of hatching. If this is done the goslings should be placed in a warmly lined box and kept warm until the hatch is completed, when they can then be returned to their mother. These eggs take from 28 to 32 days to hatch, some even extend to 34 days.

A nest should be provided for each female.

Rearing Goslings.

Goslings need no feed for the first day or so; after that they may be fed bread soaked in milk and squeezed dry. This food should be given in small quantities five to six times a day, or if an ordinary growing ration is more convenient it may be used. After the goslings commence to feed a moist mash of bran, pollard, maize-meal, green feed mixed with milk, or failing milk water, should be fed four or five times a day, and continued for three weeks. When milk is not available, 5 per cent. of meat-meal should be added to the mash.

At two to three weeks of age goslings can be given their liberty, but must have abundance of green feed and water before them at all times. If the grazing is good, one feed of mash will be sufficient per day.

When goslings are three months of age they should be ready for the market, but three weeks before this they should receive a topping-off treatment. This treatment consists in confining the birds to small pens or sheds and feeding them three times a day upon a good mash. In penning it is advisable to pen together one complete hatch, as if this is not done some will fret and lose weight. They should at this age weigh from 12 to 16 lb.

PROTECTION OF NATIVE BIRDS.

The young Australian boy is responding splendidly to the nature study movement in our schools, but there are still some homes, even on farms, into which appeals for the protection of useful native birds and against unnecessary cruelty have not yet penetrated. Nest destruction and useless egg-collecting have happily become rarer, but the pea-rifle menace is still real, especially at holiday time. To its youthful owner, every innocent thing in fur or feather is an excellent target. And so where most of our beautiful and useful bush birds were once a common sight in flight they are now extremely rare, and those that remain are becoming victims to a gradual process of extinction.

The economic value of bird life is most evident on the farm, and it is fitting that it should be most appreciated there. In fact, protection of useful birds is almost instinctive with the true countryman. Shooting game birds for the pot, without indiscriminate slaughter, may be all right, but it is the height of folly to kill insect-eating birds for food, just as it is to attempt to excuse an unreasoning and barbarous lust to kill.

A study of the habits of insectivorous birds is well worth while. They destroy incalculable numbers of insects, in both their pupal and winged stages. Continuous shooting in any district will make useful birds shy of remaining in it; they fly further afield for feeding and breeding, and so the wise farmers suffers from the folly of the less enlightened. In some districts, flocks of ibis were once very common. They followed the plough along the furrows and fed greedily on upturned grubs, but now, through the thoughtlessness of some of the local inhabitants, only an odd ibis may be seen here and there filling its craw with cane crop pests.

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture, and Chief Inspector of the Banana Industry Protection Board.

THE banana industry in Queensland, though not so extensive in acreage as a few years past, still provides the greatest production of any fruit grown in this State. The primary purpose of this contribution is to set forth the fundamental principles of banana growing in Queensland coastal areas. In view of the fact, however, that bananas are grown in Queensland over 1,000 miles of coast line, in some instances allowance must be made for specific differences occurring in widely separated districts.

HISTORICAL.

The banana, as a producer of food for man, is a plant of very respectable antiquity. Alexander the Great found it growing in India during the course of his campaign in 327 B.C. History tells us that it is sculptured on the monuments of ancient Egypt and Assyria of much earlier date. Southern Asia is believed to be its original home, and from there arose the curious legends connected with this fruit. It has been linked with the story of the Garden of Eden as being the tree of good and evil and the fruit of knowledge—hence the names given by the early botanists to the two best-known species: *Musa paradisiaca* and *Musa sapientum*. These still apply to the plantains and most of the tall-growing edible varieties. It is certain that at a very early date the banana was spread over the South Seas by the Polynesians in the course of their wanderings. To-day bananas are found in most countries enjoying suitable climates between the limits of about 29 deg. north and south latitude.

As the Cavendish is the most widely-grown variety in Queensland its distribution over the world from its original home in Southern China is of interest. In 1826 a few plants were taken to Mauritius, where they were greatly esteemed. In 1829 two plants were sent to England and grown and propagated in a hothouse. The Duke of Devonshire obtained one, and its progeny became features of interest in the Duke's garden at Chatsworth, for at this date the banana was a great curiosity to Europeans. The name *Cavendishii* was given to the variety after the owner's family name of Cavendish. In 1838 some plants were taken by the Missionary John Williams to the South Sea Islands, where their high-bearing capacity and low stature made them very popular. Since the Cavendish banana is self sterile and reproduces itself only by means of suckers, it is very probable that many of the Cavendish banana plantations established in the Pacific countries of to-day originated from the plant owned by the Duke of Devonshire over a hundred years ago.

CLASSIFICATION.

Botanically, the two divisions of the higher plants are the Dicotyledons and the Monocotyledons. The banana belongs to the latter, which division includes such diverse plants as bullrushes, palms, grasses, lilies, pineapples, &c. The family name is Scitaminaceae, which has three members—The *Musaceae*, comprising Musa (bananas), Ravenola, Strelitzia and Heliconia, all of which except the lastnamed can be examined in the Brisbane Botanical Gardens; the *Zingiberaceae* or arrowroot; and the *Cannaceae* or cannas.

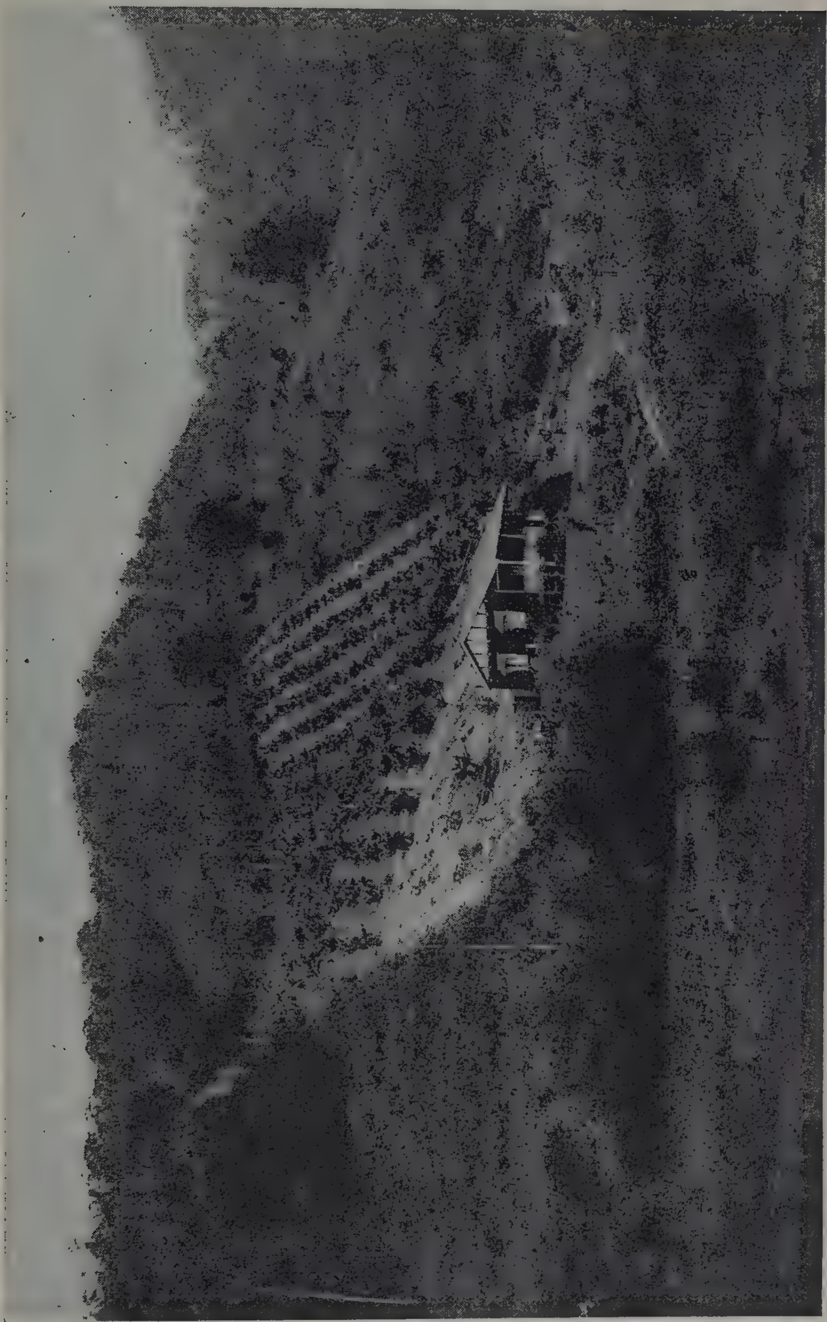


Plate 14.

THE BANANA GROWER'S HOME.—His first small plantation and his acres of fertile unimproved land, all to be brought under cultivation as time passes.

THE PLANT.

The banana is a tropical herbaceous plant growing at its best in its natural habitat—warm, moist, sheltered situations in the tropics, exposed neither to high winds nor low temperatures. Moderate heat, abundant moisture, and a well-drained soil are the conditions which suit it best. Some members of the genus *Musa* reproduce by seeds alone, others by both seeds and offshoots (or suckers), while others again are either entirely or almost completely sterile and are propagated by means of suckers only. These lastnamed types include most of the edible varieties.

Plate 15.
Seven year old Mont Marie plantation at Upper Currumbin.

The Roots.

A study of the banana root indicates the class of soil which suits it best. The long rambling roots, cordlike and fleshy, do not thicken and form wood with age. Although tough, they are easily damaged, whereupon they either die back or branch behind the damaged portion. Secondary roots are formed, but not to the extent of many other plants. The roots seem best adapted to free ranging through easily penetrated soil which will readily yield up an abundance of plant food. The delicate absorbing root-hairs can be seen along the section of the root just behind the root-cap. These hairs communicate with the vascular bundles which traverse the length of the root and carry the plant foods in solution up to the leaves where, through the agency of sunlight, they are elaborated into more complex substances. These latter are conveyed through other channels to the various parts of the plant to be utilised for growth and reproduction. Banana roots revel in a moist but well-drained soil, and will not tolerate stagnant water-logged conditions.

Plate 16.

A NEWLY PLANTED AREA.—Note logs placed across hillside to prevent erosion.

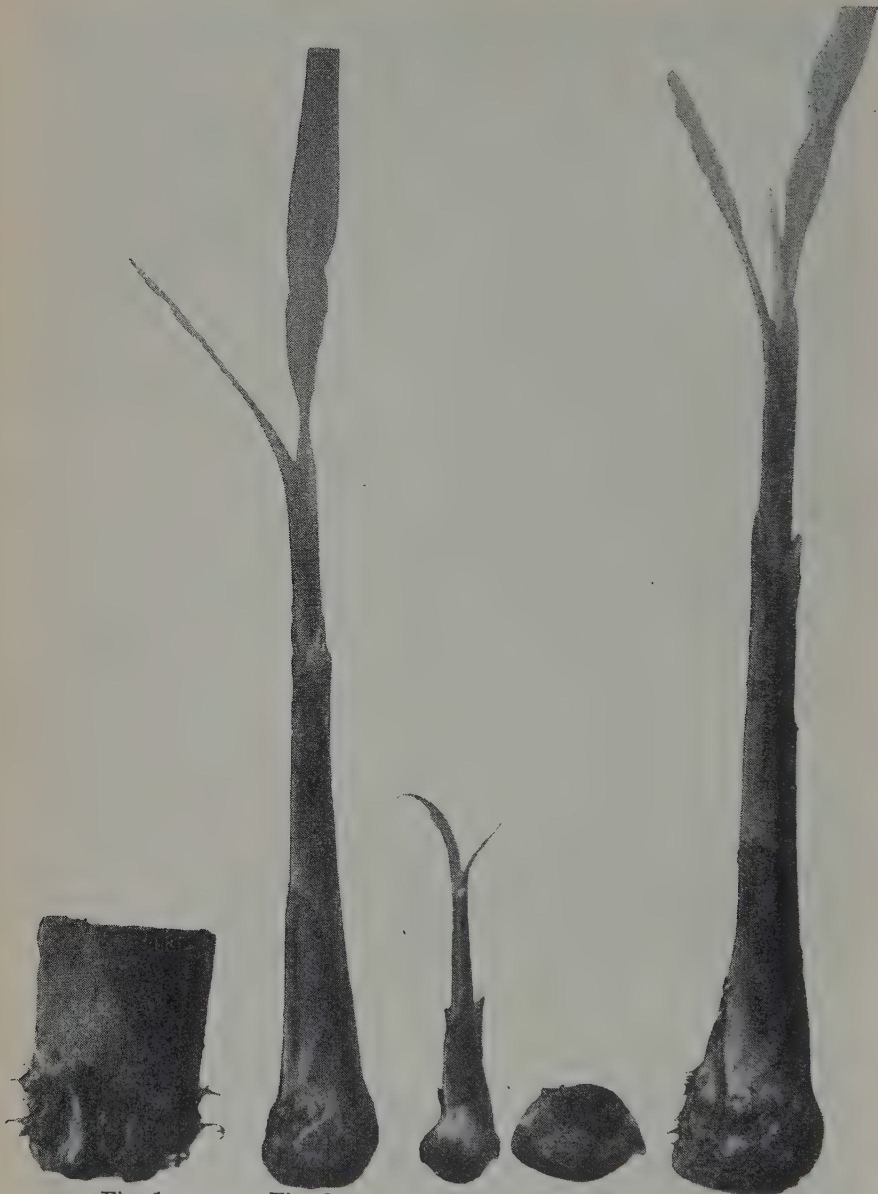


Fig. 1. Fig. 2. Fig. 3. Fig. 4. Fig. 5.

Plate 17.

PLANTING MATERIAL.—Fig. 1.—Butt, weight approximately 12 to 14 lb., trimmed down to 2 eyes (buds), one being more prominent than the other, if possible. Fig. 2.—Desirable type, well-grown sucker. Fig. 3.—Good type, younger sucker. Fig. 4.—Bit, trimmed down to one eye (bud). Fig. 5.—The correct method of trimming a sucker prior to planting. Note flattened base.

Under ideal conditions, the roots of the banana plant extend to a great distance. It is not uncommon to find shallow surface roots 10 feet away from the plant, whilst in a deep soil they will penetrate to a depth of 4 feet to 5 feet.

The Corm.

The true stem of the banana plant is the hard white portion of the bulb. From it arise the leaves which form the pseudo stem and whose bases form concentric circles around the growing point. From it also arises the inflorescence or flower stalk, which pushes its way into the open air through the tube formed by the base of the final leaf. From the corm also emerge the roots, whose vascular bundles can easily be traced into the ring of vascular tissue within its hard white substance. The corm is the storehouse of the plant. In it food is accumulated for the climax of the plant's life—the production of the bunch of fruit. The food supplies of the corm are also called upon to support the young suckers until such time as they have formed an individual rooting system and begun to forage on their own account. The structure of the corm is interesting, and a lot can be learned about the plant by cutting a young corm into sections. It will be seen that there are distinctly marked central and surrounding areas, between which is a ring, or more correctly what is practically a sphere, of tissue, somewhat transparent in appearance. The bundles from both roots and leaves can be traced into this tissue. The young sucker bud also arises from this ring of tissue, and several buds (eyes) can often be seen thrusting their way outward through the surrounding tissue. This shows that the young suckers are very directly connected with the food-absorbing and manufacturing organs of the plant.

The foregoing indicates why it is necessary to encourage a vigorous growth in the early stages of the plant's life and an uninterrupted continuance of the same until after the bunch has been thrown. It also suggests why surplus sucker growth should be kept down so as not to deplete the plant's own food store too seriously.

The Leaves.

The leaves have a most important function to perform in the life of the banana plant in so far that they may aptly be termed the factories in which the plant foods absorbed from the soil by the roots are elaborated and manufactured into a form suitable for use by the plant. Without the leaves the plant could not live. Similarly with damaged leaves, it becomes less strong, which fact emphasises how important it is for commercial plantations to be well sheltered from heavy winds which strip the leaves to ribbons and seriously curtail the complete exercise of the leaves' functions.

The part of the plant usually referred to as the pseudo stem or trunk is made up of the leaf-bases, which adopt a tightly-packed form to protect the younger leaves and the flower in their early stages and support them clear of the ground.

The leaf proper consists of a mid-rib and blade. It springs from the growing point of the corm, and ascends through the pipe made by the preceding leaf-base in a very beautiful roll. Observation will show that one side of the blade is longer than the other, and the longer side folds over to form a cap, thus effectively preventing any water from entering the interior of the roll and so damaging the growing point. On

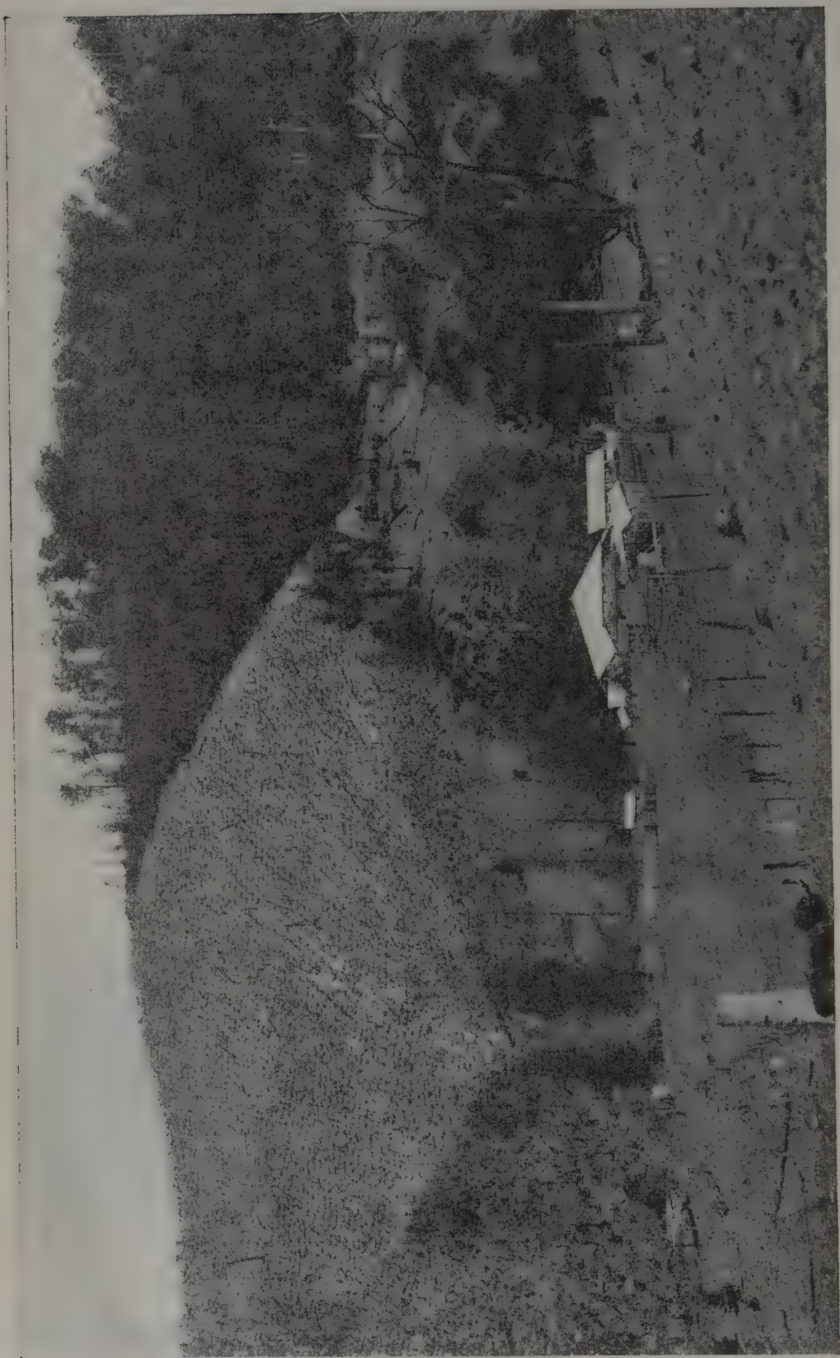


Plate 18.

Bananas and Scrub Lands, Lacey's Creek, Dayboro' District. Dairying and banana-growing makes a profitable combination.

reaching the open, the leaf gradually unfurls, whilst another leaf is pushing its way upwards. By providing the cap, above referred to, nature prevents water entering the growing point of the corm, at the same time the strong grooved petioles or leaf-stalks conduct rain and dew to the outside of the new rolled leaf following. In the emergence of the young leaves and of the bunch it seems likely that water acts as a lubricant, and greatly assists this process. It is claimed that in very dry weather when bunches become choked in the throat of the plant, the trouble can be largely overcome or even prevented by pouring water into the head of the plant. Numerous tests appear to support this claim, and all growers are familiar with the improved bunch-throw and the flush of new leaves after a good shower of rain following a dry spell.

At least the two final leaves are produced on the flower stalk, and not directly from the corm. This will be seen when the pseudo-stem of a bearing plant is carefully cut open and the leaf bases removed one by one. These two leaves are shorter than those preceding them, the final one being extremely short and having a definite tendency to hang over the flower bud, thereby protecting it from the sun. In addition to these two true leaves, the flower stalk bears one or more bracts, which soon shrivel and dry out.

Flowers and Fruit.

In the banana the male and female organs in the same flower do not function. In some flowers the male organs are degenerate, and in others the female. The flowers which form the fruits retain the pistil, whilst the flowers at the apex of the inflorescence retain the stamens. Situated between these are usually a group of degenerate flowers called neuter flowers. These are readily seen in the Cavendish, where they form short rudimentary fruits which never develop. The banana is described botanically as parthenocarpic—that is, it does not require to have the female flowers fertilized by the male to produce fruit. Fertilization is necessary to produce seeds, but seeds are seldom produced in any of the cultivated varieties. Nevertheless, an occasional seed has been reported, particularly in the Ducassas' Hybrid variety, proving that fertile pollen is produced in these individual instances. Successful crossing of the Gros Michel with other varieties has been reported from Trinidad and Jamaica, the object of such work being to endeavour to breed a new variety combining the good points of the Gros Michel with a resistance to the Panama disease possessed by some of the poorer types; such work is still in progress.

The fruit is produced in "hands" situated spirally along the bunch stalk. Climatic conditions, vigour of the plant, &c., vary the number of hands and the size of the fruits enormously within the limits of each variety. It is suggested that the length of the bunch—i.e., the number of hands—depends upon the accumulated food store and general vigour of the plant at the time the embryo flower bud is formed at the base of the pseudo-stem, whilst the size of the individual fruits (commonly known as "fingers") depends upon climatic and growing conditions subsequent to this. Thus a large bunch may produce small fingers, and under different conditions a small bunch could produce large fingers.

CHOICE OF SITE AND SOIL.

A brief examination of the main features of the banana plant and the reference to its natural home in Southern Asia gives a good indication of how best to treat it in Queensland. It is plain that, since it

requires heat, moisture and shelter, there would be no point in starting a plantation on a site subject to frost, drought, or high winds. Further, since its roots are not adapted to hard, barren or water-logged soil, it is useless to attempt to establish a plantation where these conditions are in existence. With the exception of a few isolated cases, bananas are grown commercially at a comparatively short distance from the coast in Queensland, rainfall being the chief reason for this. Precipitation decreases rapidly as one proceeds inland. Also, one must remember that

Plate 19.
Young bunch Cavendish variety.

in Queensland two divisions should be taken into account, viz., that north of Mackay and that south from Mackay to the border. Guided by these facts one must observe the following features:—In the southern section it is usually necessary to select a hillside site, because this alone supplies the requirements of freedom from frost. Such a site should be well sheltered and preferably on an east to due north slope, or where there is abundance of shelter, even a north-west slope. East to south and round to west are undesirable locations, usually being responsible for very slow growth and being too cold during the winter months. Upon occasions some fine fruit has been produced on western falls, but it is slow in maturing (in some cases up to eleven months from the time the bunch appears until it is cut), so that it is produced under definite risk right throughout. No definite altitude can be given above which bananas should not be planted, the climate in each district governing this factor. To avoid frost or the direct drift off frost-affected areas is the object, and usually from 300 to 800 feet above sea level is considered to be safe country. Land that is too steep is both difficult and expensive to work and liable to excessive erosion. Suitable level country is particularly scarce, and does not always possess good drainage. A gentle slope is therefore ideal, and when not procurable, as near to the ideal as possible should be the aim. The richer the soil, the more vigorous the growth, which fact often necessitates a careful observation of the virgin growth upon the land prior to making a selection. Good rain forest (scrub) easily comes first, particularly on basaltic slopes, but during the past twenty years such land has been utilised to such an extent that it is now almost impossible to procure a virgin area of more than a few acres south of Rockhampton. Rain forest on other types of volcanic soils is desirable, but is now almost as scarce as that on basaltic areas. Lantana country usually represents land that previously carried rain forest, had been cleared, and probably produced crops for some years, before running back into its present state. After being brushed and burnt it usually makes splendid banana land, especially where the lantana has been growing profusely for five or six years. The scarcity of suitable banana land to-day is compelling growers to seek sites in hardwood forest land that twenty years ago would have been rated as third or even fourth grade country for banana growing. Aspect, altitude, and rainfall is often quite satisfactory, but frequently the soil is most unsuitable. In selecting forest land at least 18 inches of friable surface soil is necessary, deeper if possible, and the freer the subsoil the better. Such timbers as tallowwood, bloodwood, red oak, messmate, and scrub ironbark are a fair guide to suitable forest soils, whilst white gum, red and yellow stringybark, red and grey gum, mahogany, and turpentine denote soil conditions that are unsuitable. Road access, nearness to the railway or port, and generally the suitability of regular weekly transport to local markets as well as to the principal Southern markets, and the cartage and freight in each instance, must always be taken into account. The utilisation of rich exotic pasture land suitably constituted and located is being resorted to in some instances, and although at times costly to prepare, has many points in its favour.

North of Mackay, and particularly from Cardwell to the Bloomfield River, great areas of alluvial flats are available. These areas are free from frost and, as a consequence, there is no necessity to utilise the rain forest hillsides, which are more porous and much drier after they have been cultivated for a short period. With true tropical heat and a rainfall of from 90 to 100 inches a year, banana growing becomes a different proposition, and good drainage is the one precaution to observe.

Good banana land unimproved is worth from £6 to £30 per acre, quality of soil and actual location being the governing factors.

CLEARING.

Having selected the site, the next step is to get it cleared. Naturally, the nature of the virgin growth determines the manner in which it must be cleared. Taking each class of country separately, and commencing with rain forest, or, as most Queensland growers would say, "scrub."

Rain Forest.

There are two types of scrub well known to Queensland axemen—i.e., heavy and light. The heavier the scrub, the better the rainfall, and for banana growing this is most important. Scrub is usually felled on contract, the standard price being £3 per acre. This price includes brushing (with a brush-hook) all vines and young trees having a diameter of anything up to 4 inches. Where such growth is entangled with higher growth, branches of trees, &c., a top cut is made to sever the plant 6 or 7 feet from ground level. Thus at the completion of this operation the trunks of the bigger trees are all bared of surrounding growth and easily assailed by the axemen. There is a deal of art in falling scrub, and only those possessing some years of experience can manage the task successfully. The chief object is to make all trees fall in the same direction, as logs lying side by side burn so much better than logs strewn across each other. The smaller trees are usually scarped—i.e., half cut through—and finally pushed over by one or two big trees being cut right through and being felled in the direction required. The heads of most scrub trees are more or less interwoven with vine growth, and coupled in this manner the big trees start a great weight of timber and foliage moving, and what is known as a "drive" results. It is not uncommon to witness, as the result of a good axeman's labour, an area of scrub 50 yards wide by 250 yards in length fall in similar manner to the fall in a line of dominos when the rear domino is pushed on to the one next to it, which in turn pushes the next, and so on.

All scrub timbers are known as softwoods, and as the name implies allow for the use of finely-ground tools. An all-steel heavy brush-hook and a 5 lb. axe of the "Plumb" type sharpened to razor sharpness are the tools for this work.

Scrub should be felled by the end of April and burnt off towards the end of September or the beginning of October. About noon on a hot, dry day with a gentle breeze blowing is the ideal time to fire. If, through some mischance, a poor fire occurs, heavy and expensive work follows, for a great deal of logging-up has to be done before planting. Firing scrub at the wrong time has resulted in logging-up costs in many cases amounting to £16 per acre. It is far better to wait a week or two for good weather than to attempt to burn too early. Any logs left after the fire can be cut and canted round across the hillside (see Plate 16), thus bringing about a terracing system, whereby erosion will be prevented to a very great extent.

Lantana.

The denseness of this plant when well grown is known to most Queenslanders. A 2-lb. all-steel swan-necked brush-hook (sometimes called a fern-hook) is the most suitable tool for clearing. A 32-inch long round handle is preferable to a longer one. The aim in brushing lantana

is to cut it into lengths of 3 or 4 feet, and in working over it to tramp it well down. Five pounds per acre is a fair contract price, and if the work is done properly it should carry a good fire in from six to seven weeks' time. The lantana butts (or stumps) should be grubbed with a mattock prior to planting. This partially cultivates the land and makes a thoroughly-cleared surface for planting. The intensity of the fire regulates the cost of grubbing, but usually £2 per acre is sufficient to cover this necessary expenditure.

Plate 20.

GOOD BANANA LAND.—Scrub, Lacey's Creek, Dayboro' District.

Hardwood Forest.

Normally this land is more expensive to plant than either scrub or lantana country, because in addition to falling costs of from 35s. to £2 per acre, grubbing is always necessary, and the whole area should be dug up prior to planting, which is not the case with either of the former types. A start is made by cutting down the smaller trees, lopping and stacking. Small forest brush growth (bushes, &c.) should be grubbed and thrown on to these stacks, and burnt as soon as opportunity offers. Next the whole area should be dug to a depth of 8 inches, or deeper if possible, but it is difficult to get down below this depth without incurring excessive costs. A forked hoe or long-bladed mattock is favoured, the digging costs amounting to £5 or £6 per acre. Lastly, the big timber is felled, lopped and burnt. Any logs that remain unburnt are actually lying on cultivated land, and a good chipping prior to holing out sets this land up in really good shape.

Pasture Land.

Years ago valuable areas of scrub were felled, burnt, and planted under paspalum and clover, thus becoming excellent dairying land. With a carrying capacity of as high as one beast per acre this land could not return more than approximately £8 per acre per annum. Realising this, those who are banana growers as well as dairymen, sometimes decide to bring an area of this exotic grassland back into cultivation, bananas being worth so much more than £8 nett per acre per year. This land, after having been grassed for years, will generally be free from stumps, and if the gentleness of the slope will permit, a hillside plough is used to break it up. Plough across the hillside, preferably to a depth of from 3 to 4 inches, and when the moisture has dried out, harrow with a heavy harrow and burn off as much dead grass and grass roots as possible. Plough a second time, endeavouring to get down 7 or 8 inches, and harrow again. This land is then ready to fertilize and plant. If too steep to plough, grubbing by hand must be resorted to. The mattock is the most suitable tool to use, and as the clods are turned over they must be hit with the side of the mattock so as to free most of the soil from the tightly interwoven paspalum roots. Two ploughings and two harrowings are worth approximately £5, whilst to dig this land thoroughly by hand is worth up to £10 per acre.

SELECTION OF PLANTING MATERIAL.

The selection of planting material is a very important factor, and irrespective of the variety of commercial banana grown, the principles to be observed in making a selection are more or less similar. Firstly, the source of supply should be free from pests and diseases, or, failing this, as nearly so as possible. Secondly, the material should be of good quality and taken from parent plants of true type and vigorous growth with creditable production figures recorded during the existence of the plantation. Most growers have their own ideas upon the most suitable kind of planting material, and all may be right, for soil and weather conditions probably play the most important part in the successful establishment of a banana plantation.

First consider the natural offshoots or suckers. These make excellent plants provided they are strong, healthy, 1 foot to 18 inches in total length, tapering symmetrically down from the baby spear leaf to a cleanly-grown corm, the diameter of which is from 5 to 6 inches at the widest part, and which has not been damaged by removal from the parent plant. A draining spade is recommended for the removal of these plants. After digging, cut off all roots, and square the base of the corm to allow the plant to stand upright in the hole when being planted. Planted and grown under favourable conditions, this class of material will fruit in twelve months, and three months later should see the fruit harvested.

Next is the butt, which is considered the fastest-growing and best planting material to use. A butt is obtained by removing from the stool the corm and a portion of the pseudo-stem of a plant that has recently had a matured bunch cut from it, or that is carrying a bunch or is just about to produce a bunch. Trim the base of the corm off so as to leave approximately 4 inches depth of corm, and cut the pseudo-stem so as to leave about 10 inches above the corm. This makes the total length of a butt plant approximately 14 inches, and such a plant should weight from 10 lb. to 14 lb. Shave the old roots off close to the corm. Select one or two (as desired) prominent eyes (buds) and cut out the balance, which can all be definitely classified as surplus. The same tool as recommended for the removal of suckers is excellent for the removal of this class of plant also. A skilled worker will dig as many as 200 suckers per day and almost as many butts, without damaging the balance of the stool by his haste. A butt plant has the advantage of an abundance of plant food to feed the eye, which very quickly becomes a young plant. Whilst the young roots are forming, the young plant is growing, obtaining all the nourishment it requires from the parent butt. From observations made it can be definitely stated that, given equal conditions, butt plants permit production and harvesting of the fruit as much as two months earlier than either suckers or bits (mentioned below), both of which are subject to serious setbacks as a result of dry weather following planting, and always undergo a serious retarding of growth until such time as each establishes its own individual rooting system.

Bits are sections of a butt, each carrying a good healthy eye. One butt may make as many as four bits, but they should not be cut too small. The minimum size of a bit permitted to be sold is prescribed by regulation, which reads:—"A bit shall consist of a well developed undamaged 'eye' protruding not less than ½ inch above the surface of the corm to which it is attached, the eye to be not less than 1½ inches from any edge, width of surface to be at least 4 inches, and depth behind 'eye' at least 3 inches." Under excellent growing conditions this class of planting material is quite satisfactory, but is seriously affected by dry weather until such time as a root system is established. Drought conditions following immediately the planting of this class of material invariably result in the necessity for replanting a large proportion of the area.

The price of planting material varies from 15s. to 30s. per 100 plants, dug, cleaned, and bagged ready for transport.

Black Comb Disease in Fowls.

P. RUMBALL, Poultry Expert.

BLACK comb disease in poultry occurs frequently throughout the State from October to March. It usually affects laying hens, and is responsible for heavy losses to the industry either by death or decreased egg production.

Where treatment is prompt the mortality does not appear to be as extensive as when treatment has been delayed. Again, early treatment appears to assist in getting affected birds back into production much more quickly than when it has been deferred.

The first indication of the disorder is a bird's pronounced loss of appetite, followed in the course of a few hours by a darkening of the comb. In fact, it is not uncommon for 25 per cent. of the flock to have a very darkened comb within twenty-four hours of the first sign of the trouble.

In the early stages of this disease, the temperature of sick birds rises. This induces thirst. As the disease develops, little desire for water is in evidence, and as treatment for this trouble is given by means of the drinking water, the necessity for prompt action is obvious.

On further examination of the sick birds, it will be found in most cases that the crop is full, an indication of the suddenness of the attack. This condition of the crop has caused many breeders to attribute the trouble to the food and water. As the disorder advances the legs of the leghorns particularly become very much darkened in colour; and if the feathers of a bird of any breed are turned back, the skin will be found to be darker than usual. Diarrhœa has been observed in some cases, but it is not apparent in all affected flocks.

The mortality from this disorder appears to be governed largely by the general condition of the flock, and the rapidity with which treatment is applied. Where prompt measures have not been taken, losses have been as high as 20 per cent.; but where early treatment is given deaths have been as low as 1 or 2 per cent. The loss from deaths, however, is not the only important factor. Egg production has been observed to fall from 60 to 5 per cent. within six or seven days.

Treatment.—Several proprietary mixtures are used with apparently beneficial results, but in preference to deferring treatment until these mixtures are procurable, the breeder is recommended to administer Epsom salts to the birds in the drinking water at the rate of 1½ to 2 oz. to the gallon.

The pH Scale.

R. A. TAYLOR, A.A.C.I., Inspector and Examiner, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

THE term pH is now so commonly met with by the agriculturalist that it is to his advantage to understand not merely that a pH value indicates in some way the acid, neutral or alkaline condition of his soil, but to have also some knowledge of the meaning of the value and the theory on which it is based. The following explanation, it is hoped, will assist in this direction.

Acids contain hydrogen combined in their molecules. In solution (as in the soil) the molecules of acids, alkalis, and salts break up (or dissociate) to a certain degree to form ions. The ion common to all acids and on which acid properties depend is the hydrogen ion. Now different acids containing *similar amounts of hydrogen in combination,* dissociate to different extents to give *different amounts of hydrogen ions in solution.*

Take two acids for instance—say acetic acid and hydrochloric acid. The *amounts of acid* present may be the same, and may be neutralised by the same amount of alkali, such as caustic soda, and yet the actual degree of acidity or intensity of acidity would be far greater in the case of the hydrochloric acid, because, at the same concentration, it is *dissociated into ions* to a far greater extent, and makes "available" far more hydrogen than the acetic acid.

These hydrogen ions may be considered as "free" or "active" hydrogen, and are termed *potential hydrogen*—from which the term pH is derived.

In indicating the pH or potential hydrogen, the number of litres of the solution that contain 1 gram of hydrogen ions is taken as a basis. Naturally, on account of the small size of a hydrogen ion, the numbers involved would be very great, so the logarithms of the numbers are used—that is, the number of times the figure ten must be multiplied by itself to obtain the number of litres of the solution which would contain 1 gram of hydrogen ions, is used.

For instance, if 1,000,000 (10^6) litres of solution contain 1 gram of hydrogen ions, the figure 6 is taken and the solution is said to have a pH value of 6.

The pH may thus be set down as the logarithm of the reciprocal of the hydrogen ion concentration—which may be expressed as:

$$\log. \frac{1}{CH^+}$$

The term C means concentration, and H^+ is used to indicate hydrogen ions (which are positively electrically charged).

The figures used in the pH scale range from 0 to 14; the highest figure indicates the lowest concentration (most litres to contain 1 gram of hydrogen ions) and, consequently, acid solutions are indicated by lower values than alkaline solutions.

pH7 is neutral—the pH of distilled water. As pH is a logarithmic value (based on ten) a decrease of one unit on the scale indicates an increase of ten times, and a decrease of two units indicates an increase of one hundred times the acidity. Conversely, rises in pH indicate decreases in acidity to the same extent.

Now, in summarising the practical application of the above, the pH value as applied to a particular soil may be said to be a figure in inverse ratio to the amount of hydrogen which is present in dissociated or ion form in the soil solution, and is consequently an inverse index of the true acidity. *It should not be confused with the amount of acids present in the soil* as indicated by titration against an alkali, as only portion of these acids are dissociated into ions, and, consequently, they may be said to have much of their power not available.

As a guide to the interpretation of values, the following table is given:—

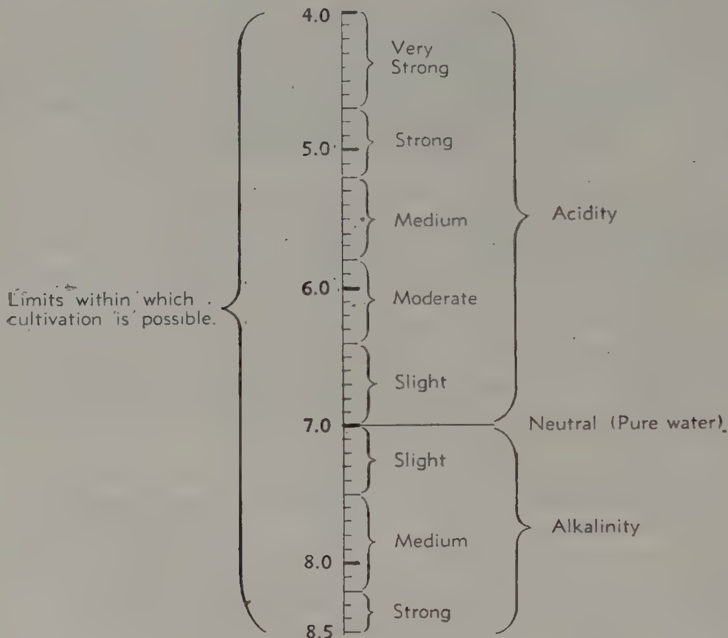


Plate 21.

From the above, it will be seen that only a small portion of the scale is used in actual practice.

ANIMAL MANURE ON DAIRY FARMS.

On the dairy farm, cow dung accumulates both in the holding yards and in the grazing paddocks. Periodically, the manure about the yards is collected and usually distributed on cultivation areas as a fertilizer. Cow manure contains a moderate amount of fertilizing materials which come originally from the pasture area, and, to use the manure on crops to be sent away from the farm is virtually "robbing the pastures to keep up the fertility of the ploughed fields."

Far more serious, however, is the neglect of many dairy farmers to make good use of the manure left in the grazing paddocks by the stock. A dropping allowed to lie undisturbed, in addition to losing much of its fertilizing value to the air, promotes in that particular spot a rank growth of grass, which stock find distasteful. If full advantage is to be taken of the fertilizing value of the manure, the droppings must be spread more uniformily over the paddock before they become hard. Distribution can be carried out by means of a special pasture harrow, or by running an ordinary peg harrow over the area, and about which several lengths of barbed wire are loosely coiled. A weatherboard or similar type of timber drag is quite satisfactory, but its use on wet dung in dry weather should be avoided in order to prevent the fouling of the pasture by extensive smearing.

—*C. W. Winders.*

The Scrub Tick.

OF the many species of ticks which may attack domestic animals in Queensland, the scrub or bottle tick is one of the most important. An unfed female tick has yellow mouth parts and legs and a greyish abdomen. When engorged with blood, the abdomen becomes reddish and, at this stage, the female may measure up to three-quarters of an inch in length. The male is uniformly yellowish and never grows more than about one-fifth of an inch in length.

The scrub tick is found among the scrubs of the eastern coast where normally it lives on bandicoots and other marsupials. It does little harm among its native hosts, but should any domestic animal be attacked, it may develop a paralysis which is frequently fatal. Dogs, cats, and sheep are most susceptible, but in the case of cattle and horses only young animals are, as a rule, affected.

Rather peculiarly, only the female ticks can cause paralysis and the males are practically harmless. Furthermore, the disease becomes apparent only after the females have been attached for at least four days. The females are then nearly fully engorged, and the paralysis is thought to be caused by a poison which is secreted by the tick at about this time and injected into the animal. Should the tick be discovered and removed after feeding for only one, two, or three days, little harm will be done. Most cases of paralysis are seen in the spring, when, after remaining quiescent during the winter, the ticks become active again.

Dogs running in scrub tick country may be protected if given every six or seven days, either a dusting with derris powder or a wash in a derris infusion. This infusion is made by soaking 2 oz. of derris powder in a gallon of water overnight and next morning adding sufficient soap to make a good lather. When being treated, the animal should also be examined for ticks in places which may not be accessible to the derris—such as inside the ears and between the toes.

For animals suffering from paralysis, a vaccine which is manufactured by the Commonwealth Serum Laboratory, Melbourne, is said to give good results. The use of a 2 per cent. solution of trypan blue is also claimed to be very effective. But no matter what remedy is tried, the more advanced the paralysis the more difficult it is to effect an improvement. —*Dr. F. H. S. Roberts.*

TO SUBSCRIBERS.

Subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.

Size of Breeding Sows.

SIZE is an important feature in breeding pigs, yet some breeders do not give it sufficient consideration.

One of the chief objectives in pig raising is to get pigs to marketable weights in the shortest possible time. To obtain the desired rapid development and still have a finished pig with a light covering of fat, it is necessary to breed from pigs which are big within their class. That is to say, pork type breeding stock—such as Middle Whites—should be big animals of their category if their progeny are to grow quickly to porker weights. Bacon type breeding stock—such as Large Whites—also should be big of their type if their progeny are to develop similarly to baconer weights. The extreme bacon type of breeding stock could, of course, be used to produce fast growing porkers, but such porkers, under normal feeding conditions, would not be sufficiently mature to give good carcases at porker weights. Breeding pigs should be big within their type.

Size is inherited in pigs as it is in horses, and trying to grow a small type pig into an extreme bacon type is like trying to make a pony into a draught horse.

Observations lead to the belief that size within a breed is frequently lost through mating stock before they are sufficiently grown.

A large breeding sow, provided she is not too fat and clumsy, is more likely to produce a litter of large pigs and to be able to suckle them better than a smaller sow, under similar conditions.

Records of a large number of breeding sows show that sows which are mated when between nine and twelve months old are more productive throughout their breeding career than sows mated earlier or later.

Under Queensland conditions, it is common to see sows mated at five to six months old when they are barely bacon weight, but this practice does not give the sows a chance to develop and become productive mothers.

The best recommendation is to mate sows when they are about nine months old, or when they have reached a live weight of approximately 250 lb. In cases where sows are mated when very young, either by accident or design, they might be given a chance to develop by withholding them from service for some weeks after their first litter has been weaned.

—*L. A. Downey.*

PASTURES FOR PIGS.

Although young pigs will not grow rapidly if given only bulky foods—such as pasture—because of the limited capacity of their digestive tract, approximately one-third of their diet may consist of good pasture. In the case of dry sows, four-fifths of the diet may be provided as pasture.

Pasture, being relatively cheap fodder, should be used to the greatest economic capacity in pig feeding. Not only does grazing provide pigs with cheap food, but it provides a measure of insurance against deficiencies of minerals and vitamins which are likely to occur when pigs are intensively housed and hand-fed.

Pigs require a relatively high proportion of protein in their food, and they are unable to cope with large amounts of fibre; it is, therefore, desirable to graze pigs on pasture or forage crops when they are young and succulent.

Annual forage crops have the advantage of yielding large quantities of green feed in a short time; also, the practice of ploughing and planting pig paddocks twice a year is a satisfactory method of providing sanitation and control of parasites in the piggery. However, some permanent pasture is usually desirable in the piggery, but it should be stocked lightly and given frequent rests to preserve the stand and to prevent fouling of the paddock.

Wherever it can be grown, lucerne provides the best permanent pasture for pigs, but to prevent the pigs from rooting and spoiling the lucerne plants their snouts should be either cut or ringed. When lucerne cannot be used Kikuyu grass is a very good substitute. Kikuyu has the advantage of being able to withstand severe grazing and rooting, and will quickly recover from drastic treatment by the pigs. It is a palatable and nutritious grass, and will thrive under a wide range of climatic and soil conditions.

—*L. A. Downey.*

CASTRATION OF PIGS.

Male pigs must be castrated while they are very young, so that they may be fit for slaughter on attainment of the correct weights. The age recommended for the operation is six weeks, or two weeks before they are weaned.

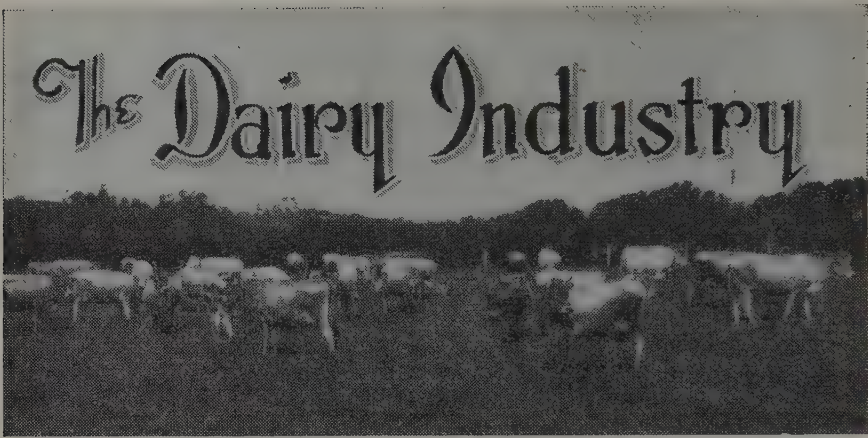
As many beginners do not know how to perform the simple operation of castration, the Department of Agriculture and Stock has made available, free of cost, a very useful and well illustrated pamphlet—"Castration of Pigs"—which gives detailed instructions in convenient form and in everyday language.

Demonstrations may be arranged, on application, in the course of the instructors' itineraries, either at gatherings where facilities exist for performing the operation, or at a slaughter-yard where young pigs are available. In the latter case it is preferable to demonstrate on a pig carrying more age—say, up to four months—and which can be killed and dressed beforehand. Demonstrating on a dressed porker simplifies procedure, and enables the instructor to explain it without the inconvenience of handling a live pig.

That a better knowledge of the operation of castration is essential is emphasised frequently by bacon factory officials, meat exporters, and slaughtering inspectors, who often come across carcases of male pigs which have been castrated improperly. Partial, if not total, condemnation of the hindquarters—the result of abscess formation, the formation of tumours in the scrotum, callous or improperly healed tissue, or some other abnormality—is the inevitable result.

Castration should be performed during cool dry weather and before flies—blowflies in particular—became numerous. Absolute cleanliness in all details, proper equipment, healthy growing pigs, and a correct knowledge of the job are necessary for success in the performance of the operation.

—*E. J. Shelton.*



Trade in Bobby Calves.

IF a substantial and lasting success in the development of a trade in veal is to be achieved, the greatest care must be given to methods of feeding, and the condition in which calves are marketed. The trade has already been of immense value to the dairy farmer, for hitherto it has been the practice on many farms of limited carrying capacity to kill all calves at birth.

Some farmers, unfortunately, have made a practice of sending calves to the meatworks as soon as they are born, and that accounts for the high percentage of condemnations, of which the principal cause is immaturity. This loss could be avoided by keeping the calves on the farm for at least ten days.

The milk of a newly-calved cow is fed to pigs and poultry, and therefore is not wasted, but it should be borne in mind that this milk would show a better return if fed to the new-born calf than if fed to pigs. The value of this milk is often not so much as a weight increaser as a preventer of weight loss. This is true of the larger breeds. With the smaller breeds its value is, of course, primarily for growth.

The law provides for a dressed weight of not less than 40 lb., and an age of not less than fourteen days.

Condemned calves are a direct loss to the farmer, and they also involve the meatworks in loss on account of wasted effort and loss of time.

Mature veal is a wholesome food article, while immature veal, which has a laxative effect on the consumer, is not allowed on the market for consumption.

This loss, due to immature calves, can be avoided if the calf is fed for a few days on its mother's milk. The calf should weigh 80 lb. or more before being sent to the meatworks. This live weight will give a dressed carcase of approximately 40 lb.

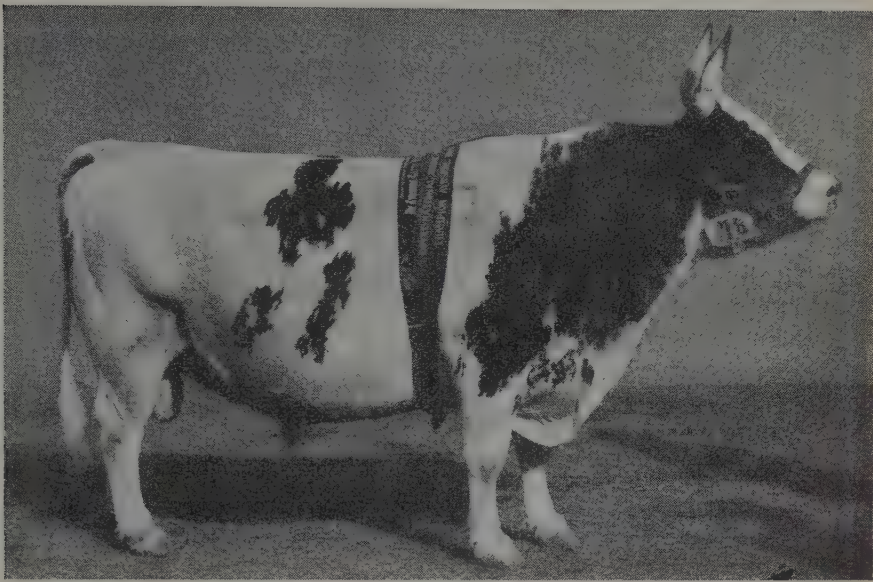


Plate 22.
MYOLA BONNIE BOY, the 1937 Brisbane Show Champion Ayrshire bull; the property of G. Norgaard.

Plate 23.
FAIRVIEW LADY BESS, Champion Ayrshire cow at the 1937 Brisbane Show; owned by R. M. Anderson.

Plate 24.
VERMONT FAIRY'S REGENT, the Champion Guernsey bull at the last Brisbane Show; owned by Stimpson's Ltd.

Plate 25.
WARRAWONG WAVON, the 1937 Brisbane Show Champion Guernsey cow; the property of Stimpson's Ltd.

ECONOMY IN DAIRY PRODUCTION.

A measure of economy which involves the dairy farmer in very little extra work is to increase production by systematic herd testing and culling, and breeding only from the best producers.

Far too many herds include cows whose production falls far below average, and the dairy would be run far more economically if these cows were fattened for the butcher. They belong to the "boarder" class, and usually consume more fodder than a heavy producer. Too many animals of this class impair the efficiency of the farm.

No matter how close a watch is kept, it is almost impossible to pick the lowest producers without systematic testing over the whole lactation period. If the farmer is prepared to do this himself well and good, but he requires to have an accurate knowledge of testing and the principles involved in calculating results.

The Department of Agriculture and Stock offers a herd-testing service which involves the dairyman in no monetary expenditure whatsoever. In other States and countries up to 6s. per cow is paid for a similar service. Surely it is impossible to believe that dairy farmers in other parts pay for something that is valueless.

In Queensland many dairymen have availed themselves of the services offered, and the results achieved by those who have tested and culled over a number of years have proved that it is well worth while. Nevertheless, there are very many more who could do so to their own advantage.

To obtain this service it is only necessary to make application to the Department. Sample bottles in a box are sent to the farmer, and all he has to do is to weigh each cow's milk and place a sample in a bottle, as directed. Then, if the factory he supplies is co-operating with the Department, he forwards the box of bottles containing the samples to that factory. Otherwise he may send his samples direct to the Department of Agriculture and Stock, which pays the rail freight.

The testing is done five times at intervals of, approximately, sixty days, and at the end of the period the farmer receives a complete return showing the relative value of each cow under test. It must be remembered that the object of testing is not so much to find out the best cows in the herd as to find out the worst and least profitable.

Testing is only half the job, and the Department depends on the good sense of the farmer to see that he does not keep feeding unprofitable cows indefinitely. Testing is of no value in raising the standard of production of the herd unless the low producers are culled regularly.

It is a poor farm that cannot afford to dispose of the two least profitable cows each year. Remember the first loss is the least. The longer the "boarders" are kept the more expensive they become. They eat the feed of a good milker and much time is wasted, frequently, in rearing their calves, which turn out no better producers than the dams.

SOME CAUSES OF STERILITY.

In each year, with careful management, the proportion of calves dropped should approach 100 per cent.; but on many dairy farms, perhaps the number of calves dropped ordinarily would not approximate 80 per cent: Hence, about one-fifth of the progeny is lost.

Apart from disease, the most common causes of sterility are protracted periods of semi-starvation, and the other extreme of overfeeding. The latter cause usually occurs among cattle prepared for the show ring. But with show cattle, the trouble may be overcome by making the animals work hard for their living, by turning them into a paddock where feed is short, and where they have to walk long distances to grass and water.

When starvation is the cause, the remedy is obvious. Failure to make provision for the hard times, which always come along, leads to loss through cows not breeding regularly, involving the loss of the calf, the production of the cow, and often the cow herself.

The provision of stacks of hay in favourable seasons, and keeping them in reserve until required may make all the difference between profit and loss.

The breeding animal should be of adult age, neither under nor over fed, and should have moderate exercise.

The common practice of allowing the bull to run with the cows is not a desirable one. With the bull kept under control he is able to serve many more cows, and the time of cows coming in may be so arranged, that they will calve when feed should be available, in normal seasons, and when butter fat is not usually at its lowest price.

—*W. Dixon.*

Plate 26.
BONNY BLANCHARD LXII., Champion Polled Hereford bull at the 1937 Brisbane Show; the property of Barton and Elliott Pastoral Co.

Plate 27.
TREVANNA ADVENTURESS, Champion Polled Hereford cow at the 1937 Brisbane Show; owned by S. A. Plant.

Plate 28.
TENT HILL STARLING'S ACTUARY, Champion Friesian bull at the last Brisbane Show; the property of W. H. Grams.

Plate 29.
GLENDALOUGH CORNDALE, Champion Friesian cow at the 1937 Brisbane Show; owned by Hickey and Sons Ltd.

WHAT IS PASTEURISATION?

Although the term pasteurisation is very commonly used nowadays, there perhaps are many who do not know its origin and meaning. Actually it dates back to 1860-1864 when Louis Pasteur, the famous French scientist, conducted experiments on "diseases" in wine and beer, and found that heating for a short period at a temperature of 140 deg. F. was sufficient to prevent abnormal fermentations and the souring of these beverages. This process of heating liquids to check the growth of undesirable microbes was extended to other industries, and was given the name pasteurisation in honour of Pasteur, who had first employed it.

To-day it is best known through its application to the dairying industry. The pasteurisation of milk simply means that the milk is heated to a temperature of 145 deg. F. for thirty minutes and then cooled as quickly as possible to 50 deg. F. or lower. Cream in the butter factories is heated to 185 deg. F. for a few seconds, and then cooled rapidly to 40 deg. F.

Pasteurisation aims, firstly, at making milk and milk products safe, by destroying any disease germs that may be present; and, secondly, at improving the keeping quality of butter and cheese made from milk and cream so treated. It, however, has its limitations. It cannot perform miracles, such as improving the grade of cream from second to choice, or eliminating strong weed taints. Most dairy farmers are now aware of this and know that the production of choice quality cream depends on the care and attention given at the farm, and that the pasteurisation process is beneficial in that a butter of choice quality can be manufactured to withstand long periods of cold storage.

—*O. St. J. Kent.*

CREAM-CAN BARROW.

A very substantial and useful cream-can barrow can be made from 14-feet lengths of 1-inch iron piping. The diagram with measurements and details should be sufficient guide to its manufacture, except that the piping should be filled with dry sand before heating and bending around a circular post or piece of wood. The

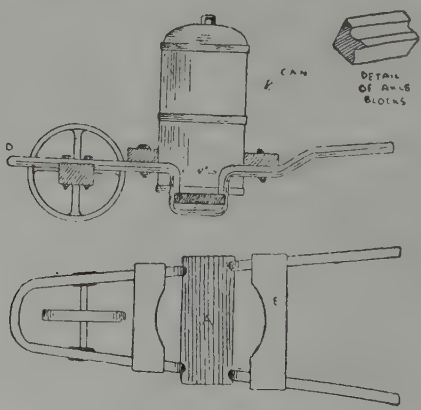


Plate 30.

barrow is very light and efficient. The front piece of wood (E) is not bolted tight, but the hooks are left loose so that the wood can be shifted when lifting the can in. A frame can be made and bolted on and the barrow used for carting bags of grain.—"Cream Can," in "The Primary Producer" (W. Aus.).

Plate 31.
HAVILAH COURT BRIDEGROOM, Champion Devon bull at the 1937 Brisbane Show; the property of R. A. Howell.

Plate 32.
DEVONCOURT CONTERRA, Champion Devon cow at the last Brisbane Show; owned by R. A. Howell.

Plate 33.
TURANVILLE BREASTPLATE, Champion Shorthorn bull at the last Brisbane Show; the property of the Turanville Estate.

Plate 34.
ALFA VALE MODEL, Champion Butter-fat Cow, Brisbane Show, 1937; the property of W. H. Thompson.

Rotation of Crops.

H. W. BALL, Experimentalist.

ROTATION of crops has been recognised in all countries as necessary in most systems of farming, if the fertility and physical condition of the soil are to be maintained at a level that will allow of satisfactory yields being obtained. Apparently, each crop requires some particular combination of plant foods, and by growing the same crop season after season on the same soil a depletion of the main plant foods required by that crop results, thus lowering seriously the capacity of the soil to produce satisfactory yields of that particular crop. By growing a proper combination of crops in rotation, this condition is largely avoided, and the productivity of the soil maintained, and even improved.

The system of rotation to practise varies naturally with the climatic conditions, the crops that can be grown profitably, and the economic conditions of a country.

Broadly, it has been accepted that a farming system should be based on the principle that most of the crops produced should be consumed by farm animals and "marketed on the hoof." Many crop rotations practised in different parts of the world, therefore, include a continuation of crops, which are either grazed off by stock or are harvested for fodder, the resultant manure being spread over the land and ploughed in for the next crop. Where such a system is practised, the bulk of the plant food consumed by the growing crop is thus returned to the land, and, in addition, the organic matter ploughed under maintains the soil in sound physical condition. In the industries where stock raising cannot be combined profitably, it becomes necessary to practise rotations whereby nitrogen, the growth-producing plant food, is replenished. Throughout the wetter districts this is accomplished by growing nitrogen-developing crops—such as cowpea, soybean, clovers, and plants for ploughing under as green manure. Investigations have shown that such green manuring has a marked effect on the yields of following crops. For instance, average yields of 15 bushels of maize per acre where maize followed maize have been improved to 50 bushel crops by the growing and ploughing under of a legume between crops of maize.

In districts of light summer rainfall, however, green manuring has not proved so beneficial, as the drier conditions do not allow of sufficiently rapid decomposition to make supplies of nitrogen available for the following crop. The practice of long fallowing has, therefore, been developed, particularly in wheat growing countries. Where the crop is cut and threshed, ploughing is done as early as possible afterwards, and the land left in a rough state to absorb all subsequent rains. Where the crop is stripped the remaining straw is burned before ploughing, otherwise the body of dry material turned under would not rot in time to allow of the formation of a compact seed-bed. In addition, there would be a reduced supply of nitrate nitrogen available, due to the soil bacteria being unable to decompose such a body of dry material.

Crop rotation has received little attention in Queensland because of the natural fertility of the farming lands, which have been under cultivation for only a comparatively short period. Climatic conditions also have favoured the cultivation of a particular crop within a well-defined area, so that the obvious tendency is to specialise. Specialisation has, in consequence, resulted in crops—such as wheat, cotton, peanuts and arrowroot—being restricted to districts which have proved suitable for their successful production. This practice has often led to neglect of alternative crops. However, in spite of the climatic and economic conditions favouring one crop farming, the need for a more diversified system is already apparent on many of the soils of old cultivations, where the tendency to specialise in one crop has resulted in decreased fertility and impaired physcial condition of the soil, with a consequent reduction in the yields obtained.

The weed problem has also become acute, and in districts such as the Eastern Darling Downs, wild oats and similar weed pests have seriously diminished returns in recent years, disclosing the need for a planned rotation which includes the growth of crops for sheep feed, and row crops which necessitate inter-row cultivation.

The system of rotation practised will naturally be limited to those crops which can be utilised profitably, but in districts where dairying and sheep raising are engaged in, no difficulty should be met with in planning a suitable rotation. Where wheat is the main crop, it may be necessary to include it often in the rotation system, either in consecutive or alternate years. A four-year rotation, taking this factor into consideration, is suggested hereunder, not as an ideal plan, but in order to permit of half the cultivation area being cropped to wheat each year—

1st year—Wheat.

2nd year—Land summer fallowed and sown to oats and vetches for grazing.

3rd year—Wheat.

4th year—Land summer fallowed and sown to annual types of winter grasses and legumes, to be followed by wheat the next autumn.

This plan does not cover the growing of summer crops (fodder and hay), as the change over from winter to summer crops is inconvenient. Besides, it is preferable to include such crops in a separate rotation in respect of the lighter rainfall lands.

With prices for grain crops remaining more or less static, dairying and general live stock farming will assume greater importance, necessitating the cultivation of a variety of crops for effective maintenance.

Although a four or five-year rotation would be preferable in relation to soil fertility and crop yield, it is realised that no one rotation can be suitable for every farm or every locality, for soil, climate, area under cultivation, and marketing conditions must all be taken into consideration.

In Queensland cotton areas, for instance, it has been found highly desirable to grow cotton in rotation with grassland, for better yields are obtained, the quality is generally improved, and the cost of cultivation is lowered through the decreased weed growth. The quality of the grass is also maintained at a higher level than is the case in long established grassland. Detailed experimental work to determine the most economic rotations for the varying soil and climatic conditions prevailing in Queensland is therefore a profitable field for research.

Whatever plan of rotation is followed, it is most important to include prominently hay, silage, and fodder crops, for it is preferable to have too much feed rather than too many live stock.

In the chief wheat-growing areas of the Southern States of Australia, the rotation is wheat, oats for grain or hay, and bare fallow; although there is now a tendency to include grazing crops in order to prevent the eventual depletion of humus in the soil, and thus necessitate the ploughing in of green manure crops.

Where silage, fodder, and hay crops for dairying only are considered, the position is simplified, for the coastal lands utilised for dairying will usually produce satisfactory crops of maize, sorghum, millet, cowpea, lucerne, and the winter cereals in average seasons. Crops such as maize for grain, potatoes, pumpkins, and arrowroot—where climatic conditions are suitable—can be included to meet individual requirements, provided that sufficient attention is given to thorough cultivation. In favoured districts, or where irrigation is practised, both summer and winter crops can be grown in succession, but unless fertilizer is applied such a system will rapidly deplete the fertility of the land. By selecting suitable early-maturing varieties, a sufficiently long interval between harvesting and the sowing of the next crop can be obtained to permit of adequate cultivation for succeeding crops.

For maximum returns, the fertilizers required for each crop and particular soil type, must also be applied in addition to any rotational system. Undoubtedly, the rotation of crops reduces the fertilizer bill, in that it makes the fertilizer more efficient. Every farmer, therefore, is recommended to study this subject very carefully and evolve a plan whereby his whole farm is brought under a rotational scheme that will enable him to obtain the maximum benefit from the crops he grows.

To summarise: The advantages of a rotational system are self-evident in the larger crops obtained, greater economy in the use of artificial fertilizer, the addition of nitrogen to the soil by the use of leguminous crops, the addition of humus resulting in an improved physical condition of the soil, the control of weed growth, the decreased injury resulting from pests and diseases, decreased effect of market fluctuations because of the variety of crops raised, better distribution of labour throughout the year, and the greater numbers of stock carried where diversified farming is practised.

In the final analysis, the best rotation system is the one that pays best, but the returns can only be determined accurately over a series of years.

The Maize Trap Crop for the Control of Corn Ear Worm in Cotton.

W. J. S. SLOAN, B.Sc.Agr., Assistant Research Officer.

OF the many plants selected by the corn ear worm on which to breed, maize is the most attractive. The maize trap crop system attempts to utilise this preference for protecting cotton crops against severe corn ear worm attack. In this system, maize is planted in regularly spaced blocks through the cotton field at intervals during the season.

During the past cotton season, a farm of 36 acres at Biloela was planted according to this system to examine the possibilities of its general use. An additional feature was the treatment of the maize with a solution of the following formula:—1 lb. lead arsenate, 1 gallon molasses and 1 gallon water, in an endeavour to destroy larval populations of the corn ear worm bred on the maize.

The experimental field was so arranged that a space was left for four rows of maize between every 96 rows of cotton at the time of planting. Three weeks after the cotton was planted, two rows of maize were sown and three weeks later the remaining two maize rows were planted. As each maize planting came into tassel and ear, it was treated once with the poisoned molasses solution. The solution was flipped onto the maize with a whitewash brush from a half kerosene tin bucket at the rate of about twenty gallons per acre of maize.

The season was a mediocre one, but the yield from the protected field, which included approximately 1⅓ acres of maize, was fifty-six bales containing 24,413 lb. of clean seed cotton. The cost of materials used was £1 3s. 10d. Labour was not an important factor, as only two days were required to treat the maize.

The use of a maize trap crop which is swabbed at the silking stage possesses many attractive features, but at the same time it has certain disadvantages.

The system is cheap and not laborious; it requires no expensive machinery and the time to apply the swabbing solution is easy to estimate.

On the other hand, it may not be possible to plant maize regularly, because of inadequate soil moisture and even if the maize does germinate, sufficient rain may not be received later on to advance its growth.

In contrast to dusting, this method aims solely at the control of the corn ear worm. With dusting, some degree of control of other pests, such as the rough boll worm and various leaf eaters, may also be obtained.

The use of a maize trap crop for the control of corn ear worm in the cotton crop is not a new idea. In practice, however, attempts to exploit the method in Queensland have generally been unsuccessful owing to the frequent failure of one or more plantings and to the hesitancy of the farmer to cut the maize before it matures in order to minimise corn ear worm infestation in the more important cotton crop. The use of a swabbing mixture may permit the harvesting of the maize for grain without reducing the efficiency of the trap crop for the control of the corn ear worm. The stalks, however, cannot be fed to stock owing to the risk of poisoning. The past year's work is sufficiently promising to justify a considerable extension of the experimental work on trap crops in the current season.

A Home-made Hay Press.

IN response to numerous requests, the following notes on the construction of a home-made hay press which appeared in a back number of the Journal are reprinted:—

In the hay press represented in the accompanying sketch the rollers (A) and wheels (B) are made from well-seasoned round posts. The bed is made of five 5 in. by 4 in. hardwood beams set on two 8 in. by

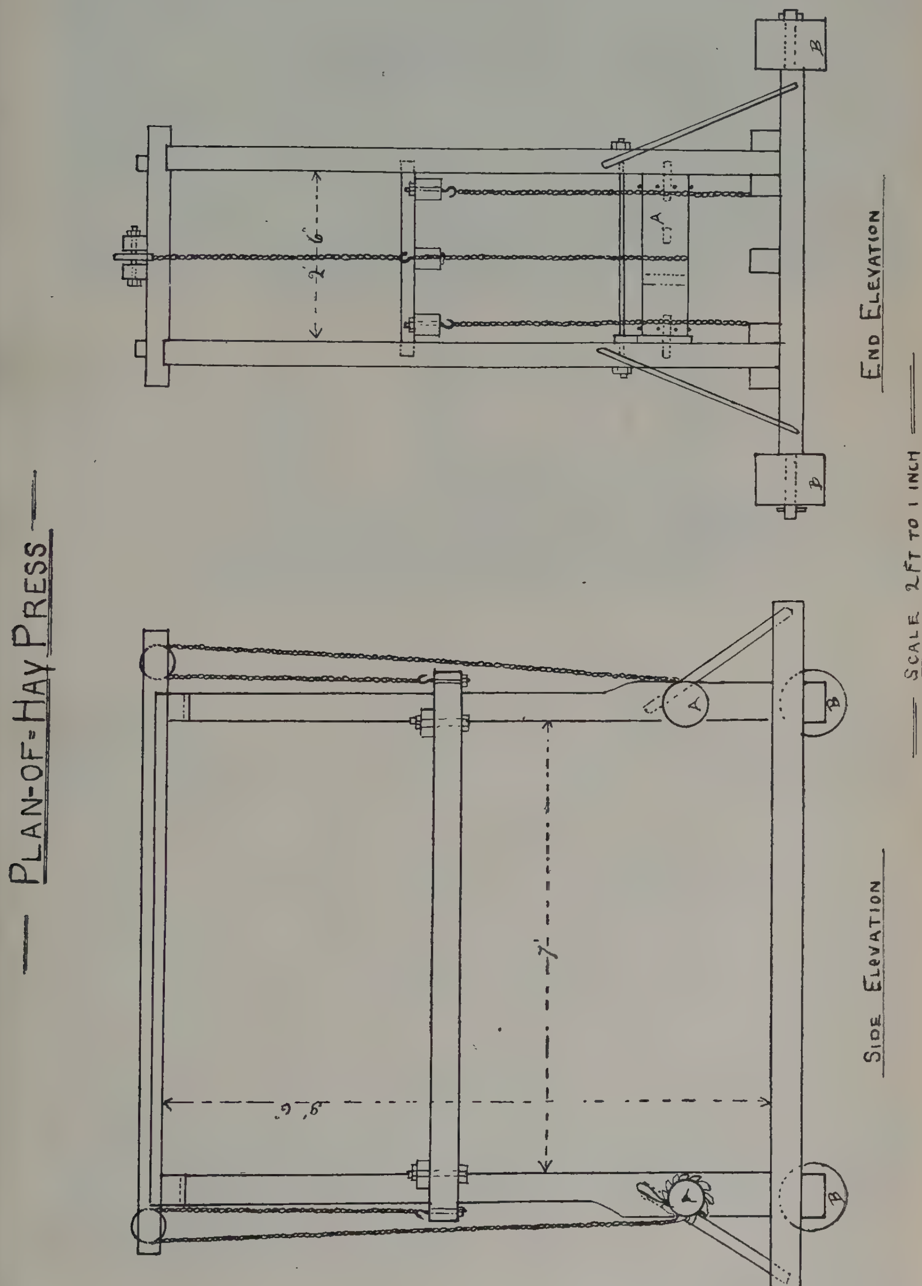


Plate 35.
Home-made Hay Press at the Queensland Agricultural College.

4 in. hardwood crosspieces. The uprights start at 8 in. by 4 in. and at a height of about 2 ft. are reduced to 5 in. by 4 in. Each upright is stayed in two directions with iron stays attached to the bed. At the top, 5 in. by 4 in. crosspieces hold the uprights, while above these are three members running the length of the press; the two outside pieces are 3 in. by 2 in., the centre piece 8 in. by 4 in. The latter is slotted at either end, and carries two 6-in. pulley wheels. The winding rollers (A) are set about 16 in. above the bed, and each has a ratchet wheel at one end. The rollers have two square holes through them set at

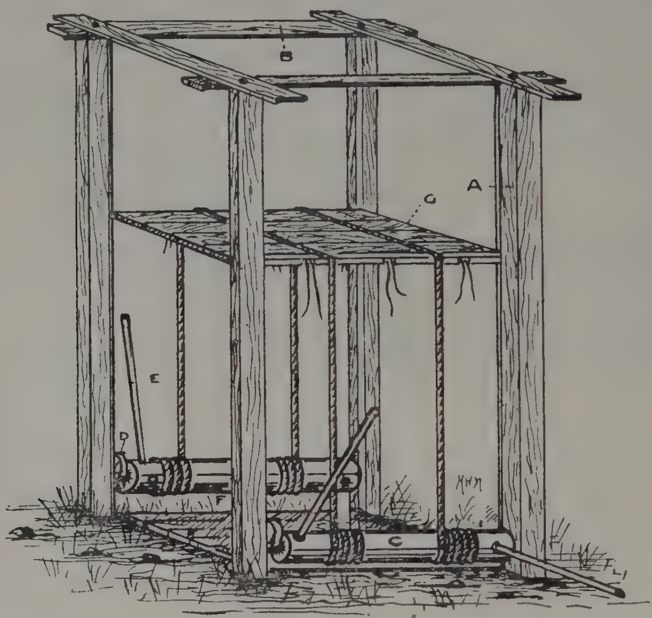
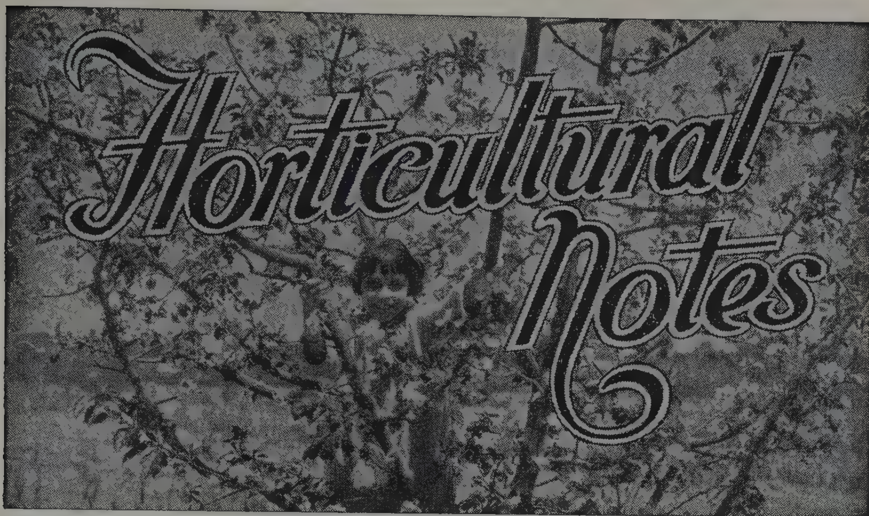


Plate 36.

right angles and near the centre; these are for the insertion of spokes for winding up the chains. A short distance above the rollers are 1 in. iron bars holding the uprights rigid and preventing the rollers from jumping out of their bearings. This bar also carries ratchet pawl. The floating top is composed of three members, 5 in. by 4 in., held together with two 4 in. by 2 in. crosspieces. The outside 5 in. by 4 in. are attached to the crosspieces by bolts which work in slots, so that the width of the floating top can be adjusted. From each end of the centre member of the floating top a chain passes over the pulleys and back to the rollers (A). This enables the top to be raised, and it can be held in any desired position by means of the ratchet wheels. The length of the bales is controlled by nailing chocks across the bed and the under side of the floating top. These chocks hold in position 3 in. by 2 in. uprights, which fit between the beams of the floating top, and so do not interfere with its movement up and down. Having adjusted the size of the bales, the floating top is raised, the required amount of hay put in, then the floating top is released and settles on the hay. To develop the pressure, four chains are attached to the ends of the outside members of the floating top. These are now attached to the rollers by hooking on to pins which are driven into the roller near each end. The pressure chains are wound round the roller in the opposite direction to the central lifting chain, so that on using the winding spokes the lifting chain is unwound as the pressure chains are wound up. It only remains to wire the bales and trim them.



Walnut Culture.

C. SCHINDLER, B.Sc.Agr., Fruit Inspector.

IN the Killarney district, near Warwick, some walnut trees are growing vigorously, each bearing an annual crop of about 80 lb. of nuts. Some of them are growing on deep basaltic soil, while others are rooted in deep black alluvial soil on the banks of Spring Creek and the Condamine River. There is room for further plantings of walnuts, especially along the river banks, and as the trees require very little care once they are established, it is suggested that owners of suitable land should consider the advisability of planting them instead of the willows usually grown in such situations.

Productivity of Walnuts.

All the sound walnuts now produced in the Killarney district from seedling trees of several types command a ready sale at a shilling a pound. The average yield over a number of years approximates 80 lb. of nuts. Selected varieties cared for properly would probably yield much more.

Walnuts of most varieties bear profitable crops in from six to ten years, and continue bearing for many years. Trees at least thirty-seven years old on the basaltic soil in the high lands near Killarney are still bearing profitable crops. Some trees growing near the banks of Spring Creek are at least twenty years old. Californian groves forty-five years old are still among the most profitable in the world, and experience there indicates that widely-spaced trees will live longer than trees planted closely together.

Climatic and Soil Requirements.

Low frosty sites should be avoided, as even light frosts will destroy during the flowering period much of the potential crop. This risk may possibly be reduced by planting late-flowering varieties. Frost also causes considerable injury to young shoot and leaf growth. Hot, dry weather during the summer may cause injury to the nuts.

The best walnut-growing areas in California have a long growing season free from frosts, low daily temperature range, a maximum temperature rarely above 100 degrees, and moderate winter temperatures and high humidity (especially in summer).

The best walnut-growing soil is a well-drained, deep, medium heavy silt loam, containing an abundance of organic matter. Light sandy soils produce slow-growing, stunted, poor-yielding trees, with nuts very susceptible to sunburning. Heavy clay soils, and soils with heavy clay subsoils, are unsuitable. Good drainage is essential. An abundant supply of water throughout the year also is necessary; therefore, a high rainfall is required, unless the trees are growing near a watercourse.

Plate 37.
A Walnut grove gives generous shade and shelter on a highland farm near Killarney.

Varieties.

The nuts from the trees growing at Killarney are of two varieties, Placentia and Franquette. Characteristics of the Placentia are: Fairly smooth, oval; not very well sealed; kernel, smooth; plump, and light-coloured; shell thin, but strong. The shell of these nuts separates very easily from the edible portion, and this should be of particular value for confectionery purposes. Franquette blooms very late in the season; nut reasonably large, elongated and somewhat pointed; fairly smooth; shell thin and well-sealed; light-coloured kernel.

Two varieties which have been introduced into Australia recently are Freshford Gem and Wilson's Wonder. The latter bears a very large nut, and is claimed to be a very precocious and heavy cropper. Freshford Gem gives 10 oz. of kernel per lb. of nuts, against Wilson's Wonder 7-8 oz., and it is said to be one of the finest flavoured nuts known.

Seedling trees may take fifteen years or more to bear, and show considerable variations in type. Consequently, the planting of budded or grafted trees of proved satisfactory varieties only is recommended.

Walnut flowers are unisexual, flowers of both sexes being borne on the same tree. In some cases, young trees bear female flowers years before the male flowers appear, and even where both kinds of flowers are present they are not always ripe at the same time. Hence, in order to get maximum production as early as possible, interplanting of several varieties (including at least one which produces male flowers when quite young) is necessary.

Propagation.

The Californian black walnut (*Juglans hindsii*) as a stock is more vigorous than the seedling English walnut, and is resistant to armillaria root rot. Several hybrids of other species of walnuts are also used; at East Malling, these are multiplied by layering. The stock is grown for one year and grafted just below the surface of the ground in early spring, using a whip graft. The walnut can also be budded, using either the ordinary method or the flute-bud.

Plate 38.
Walnut trees on uplands near Killarney at least thirty-seven years old.

Nuts to be used for seed should be gathered as soon as they have fallen from the tree, and stratified till planting time (about the middle of July). If this is not done, walnut seed may be soaked in water for a week before planting to hasten germination.

Planting and Care of Young Trees.

For a mature orchard, trees 60 feet apart each way, planted on the square system, have given the highest production per acre, but up to the age of about fourteen years the trees need not be more than 30 feet apart. At this age the trees can be thinned out, and the remaining trees allowed to grow to their full size. Alternatively, the trees can be planted 60 feet apart in the first place, and can be intercropped with suitable quick-maturing trees or vegetables.

The growing of a few trees of each of the three most promising varieties (Freshford Gem, Wilson's Wonder, and Franquette), rather than the use of one variety only, is advisable, as these varieties have not been compared under Queensland conditions. In any case, the use of several varieties will probably increase the crop on account of better pollination.

Trees should be planted in well-prepared land in August or September. The usual care in planting and watering should be bestowed on the young trees.

Plate 39.
A grove of Walnut trees on a bank of a brook near Killarney, twenty years old.

Pruning.

The object of pruning is to make a sturdy vase-shaped tree. At the time of planting, the one-year-old "whip" is cut back to about five feet from the ground. Trees thus planted will frequently start to grow first from the lower buds, and will send out shoots along their entire length. When the lower lateral buds have made a growth of from four to six inches, it is advisable to pinch off the growing tips, which will have the effect of forcing the growth into the upper shoots which are to form eventually framework of the tree. For a few years after planting, crossing limbs should be cut out and the most vigorous shoots topped to form a well-balanced tree. Afterwards, the only pruning necessary is the removal of crossing and broken limbs. The fruiting limbs should not be headed back, as this will promote a rapid growth of water shoots near the ends; any limbs which are not wanted should be cut out entirely. All pruning cuts should be made carefully, and large wounds painted with weatherproof paint, for walnut wood decays very easily.

Cultivation.

The space between the trees may be cropped, taking care not to check their growth. Cultivation in a similar way to other orchard trees is recommended, but the mature trees producing good crops in the Killarney district receive no such attention.

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APPLE LITTLE LEAF.

The disease of apple trees known as little leaf has become fairly widespread in the Stanthorpe district in recent years. It causes considerable losses both from the cessation of growth of affected leaders and their lowered productivity. No adequate explanation of the cause of the trouble has yet been made, but fortunately there is evidence that the disease may be controlled by the application of zinc. The beneficial response following the use of zinc has recently been demonstrated at Stanthorpe.

The best method for the application of zinc is still in doubt, as is also the period for which one application will protect the tree, and extensive experiments to elucidate these and other points are being carried out. In the meantime, a consideration of the serious effect on the trees of even one year's delay in the application of control measures would warrant orchardists applying the method which has shown the best commercial results to date. This is the application of a zinc lime spray to the trees when in full leaf. The zinc lime spray is made up by dissolving 8 lb. commercial zinc sulphate in about 70 gallons of water and adding 4 lb. hydrated lime dissolved in 4 gallons of water while stirring. The mixture is then made up to 80 gallons and is ready for use.

The zinc has given good results when used on trees which had one or more leaders affected with little leaf, but were otherwise making good growth. Small leaves occur on many trees which are non-vigorous, owing to poverty of soil or from other causes. Some of these have a superficial resemblance to those affected with little leaf. It is, of course, not anticipated that the zinc lime spray will benefit trees other than those definitely affected with the little leaf disease.

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

DECEMBER has been noticeable for the great fluctuations in prices. The market for stone fruits and tomatoes has moved up and down on many occasions. This should show growers how it is almost impossible to forecast prices for these fruits in advance. The large carry over of old seasons apples has had a most depressing effect on apple prices. This will also effect the new season's crop to some extent.

Bananas have eased in price with the usual holiday drop in Melbourne. The rain has continued almost to the holidays, giving promise of heavy crops in the coming season. The following were the ruling market prices during the last week of the month of December:—

TROPICAL FRUITS.

Bananas—Cavendish.

Brisbane.—Nines and eights, 10s. to 13s. 6d. Sevens, 6s. to 12s. Sixes, 5s. 6d. to 10s. 6d. Smalls, 4s. to 7s.

Sydney.—Nines and eights, 12s. to 16s. Sevens, 10s. to 12s. Sixes, 8s. to 10s.

Melbourne.—Nines and eights, 8s. to 12s. Sevens, 7s. to 9s. Sixes, 6s. to 8s.

Adelaide.—Nines and eights, 16s. to 20s. per case.

Lady's Finger.

Brisbane.—5½d. to 10d. per dozen.

Cavendish.

Brisbane.—2¼d. to 6¾d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 5s. to 7s. per case; 1s. 6d. to 5s. per dozen. Ripley, 6s. to 8s. per case; 1s. 6d. to 5s. per dozen.

Sydney.—12s. to 16s.

Melbourne.—10s. to 14s.

Adelaide.—15s. to 17s.

Growers are again reminded that with less rain and more dry weather the conditions governing the colour of the fruit are changing. Care must be taken in selection for long distance markets. With the high incidence of Soft Rot (Water Blister) cutting the fruit from the plant is recommended for all markets.

Papaws.

Brisbane.—Yarwun, 7s. to 9s. per tropical case; Gunalda, 4s. to 5s. per bushel; local, 1s. 6d. to 3s. 6d.

Sydney.—6s. to 14s. per tropical case.

Melbourne.—12s. to 16s. per tropical case.

Hot weather is now being experienced in Melbourne and Sydney. Papaws should not be sent to these markets showing too much colour.

Mangoes.

Brisbane.—3s. to 5s. per bushel; fancy varieties higher.

Melbourne.—8s. to 10s. per bushel.

Only fancy varieties are saleable in Sydney and Melbourne, where there is a keen demand for good fruit.

CITRUS FRUITS.

Oranges.

Brisbane.—9s. to 12s. New South Wales Valencias.

Grape Fruit.

Sydney.—6s. to 10s.

Melbourne.—5s. to 13s. per bushel.

Lemons.

Brisbane.—Gayndah, 12s. to 16s.; locals, 7s. to 11s. per bushel.

Sydney.—2s. to 6s. per bushel.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Yates, 5s. to 8s. 6d.; Granny Smith, 5s. to 9s. old seasons; William's Favourite, 3s. to 5s.; Gravenstien, 4s. to 8s.; Stanthorpe Cookers, 3s. to 5s.

Sydney.—New Season's Cookers, 2s. to 8s.

Old season's apples are having a detrimental effect on the new season's fruit. This fruit in most cases should have been out of cold storage weeks ago.

Pears.

Brisbane.—Stanthorpe Clapps, 4s. to 6s. per bushel case.

Peaches.

Brisbane.—1s. to 2s. per half-bushel.

A few special higher.

Nectarines.

Brisbane.—3s. to 5s. per half-bushel.

Plums.

Brisbane.—Angelinas, 3s. to 5s.; Santa Rosa, 2s. to 4s.

Apricots.

Brisbane.—3s. to 4s. per half-bushel.

Sydney.—8s. to 10s. per half-bushel.

OTHER FRUITS.

Grapes.

Brisbane.—Local grapes—Chouch, 2d. per lb.; Black Hamburg, 2d. to 2½d.; Cominya, 3s. to 4s. per half-bushel; Roma Muscats, 5s. to 7s. per half-bushel.

Tomatoes.

Brisbane.—Local, ripe, 2s. to 5s.; local, green, 1s. 6s. to 4s.; Stanthorpe, coloured, 3s. to 8s.; others, 3s. to 5s.

Passion Fruit.

Brisbane.—First grade, 3s. to 5s.; second, 2s. 6d. to 4s.

Sydney.—2s. to 8s. per half-bushel.

Melbourne.—6s. to 10s. per half-bushel.

MISCELLANEOUS—VEGETABLES, ETC.

Watermelons—Small, 1s. to 4s.; large, 6s. to 8s. per dozen.

Rockmelons—1s. to 4s. per dozen.

Cucumbers—2s. 6d. to 4s. per bushel.

Pumpkins—2s. to 3s. per bag.

Marrows—6d. to 1s. 6d. per dozen.

Lettuce—1s. to 2s. 6d. per dozen.

Cabbages—7s. to 10s.; inferior lower.

Beans—1s. to 2s. per bag.

Peas—3s. to 4s. per sugar bag.

Chocos—6d. to 9d. per dozen.

SOUTHERN FRUITS.

New South Wales Cherries—5s. to 8s. per tray.

THE CAPE GOOSEBERRY.

Actually, the Cape gooseberry is not a true gooseberry, being of the same family as the tomato, potato, and tobacco. This fact suggests immediately the class of soil it requires and what would be a suitable location for its growth.

The Cape gooseberry is best propagated from seed, 1 oz. being sufficient to plant an acre. Sow the seed is a carefully prepared seedbed in the same way as tomato seed is sown. Cover the seed to a depth of half an inch, using a rich loam, with a fair percentage of dry horse manure, if possible. Keep the bed moist, but shading is not necessary under normal conditions. The young seedlings grow rapidly, and should be ready to transplant in, approximately, eight weeks from sowing. Harden the plants off by reducing the watering gradually prior to removing the plants, but give the bed a thorough soaking immediately before lifting the young plants.

Plant in a well cultivated field in rows 4 feet by 4 feet apart. Water the plants at the time of planting. If land requires fertilizing, apply as a top dressing 1 part of sulphate of ammonia to 2 parts of superphosphate. A small amount of sulphate of potash applied just before the fruit appears is an advantage.

Harvesting may commence approximately three months after transplanting. The season lasts two to two and a-half months, regulated to a large degree by the season of the year. A fair crop would be about 3,000 lb. of fruit per acre, although much heavier yields have been recorded from time to time.

The market price ranges from 4d. to 7d. a lb. locally. The demand for this fruit is good, with little chance of a glutted market. The fruit is sold as fresh fruit, or for jam or preserves.

The chief troubles affecting the Cape gooseberry are downy mildew (control by spraying with the Bordeaux mixture 4-4-50); and soft, brown scale (control by spraying with white oil 1 in 56). Annual planting is recommended, but, if pruned back, the plants do quite well for two seasons.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Ayrshire Cattle Society, production charts for which were compiled during the month of November, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORN.				
MATURE COW (STANDARD 350 LB.)				
Valera Sheila	M. C. and A. M. Sullivan, Pittsworth	9,938·86	465·045	Royalist of Strathdhui
SENIOR, 4 YEARS (STANDARD 330 LB.)				
Valera Sally	M. C. and A. M. Sullivan, Pittsworth	12,322·77	438·915	Blacklands Daphne's Boy
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Flower 12th of Sunnyside	P. Moore, Wooroolin	8,025·25	270·906	Cosey Camp Rupert
AYRSHIRE.				
MATURE COW (STANDARD 350 LB.)				
Fairview Lady Bess	R. M. Anderson, Southbrook	12,457·14	452·494	Longlands Bonnie Willie II.
SENIOR, 3 YEARS (STANDARD 290 LB.)				
Myola Lady Jean (197 days)	R. M. Anderson, Southbrook	7,617·76	321·838	Fairview Combination

The Tropics and Man

Hot Climates and Reproduction.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

Second Series: No. 6.

THIS question is one that must arouse universal interest amongst tropical dwellers, and concerning which there has been considerable discussion. I shall try to summarise for you here the probable balance of opinion upon this problem and to indicate the way in which future policy should be bent in this regard.

Balance of Opinion.

One finds the most emphatic statements made by medical men, nurses, and others that maturity occurs at a definitely earlier age in the tropics, particularly in girls. On the other hand, nearly every careful investigation that has been made upon a statistical basis has failed to reveal any significant difference in this direction. The age of maturity is notoriously variable, and it would appear to be very easy to note and remember those cases which fit in with a preconceived idea, and to forget those cases which do not agree. In any case, it would not seem to be a matter of great moment to Europeans as our social system delimits the age of marriage.

There is no adequate evidence so far as I am aware to show that fertility is reduced by residence in tropical climates, except through some non-climatic factor such as disease. It is true that the fertility of numerous native races is declining, but this is not, of course, attributable to climate, as the climate has remained unchanged while the fertility has declined. The exact cause of this decline is difficult to fix; in some way or other, it seems to be associated with the advent of European civilisation, though even this is not conceded by some investigators.

Hot climates have never been shown to have any effect upon the processes of pregnancy. Inasmuch as the crippling diseases of scarlet fever and rheumatism are less common and less severe in the tropics, benefit may accrue, although in malarious areas other diseases take their place. Medicinal dosage with quinine has apparently little or no effect upon childbirth.

The Mother.

As I have stated, the mother has nothing directly to fear from hot climates as affecting a normal pregnancy. If there is any abnormality the position may be a little altered. If the fatiguing effects are increased by any complication, then they will be somewhat more acutely felt and come on somewhat more readily than in temperate climates. From this point of view there may be a greater strain upon bodily and mental stamina, and greater nursing care may be required. It is naturally the case, also, that greater attention has to be paid to ensuring bodily comforts and adequate rest in hot climates. These are all measures suggested by common sense, and, for the most part, easily carried out.

I admit that they are not carried out to the extent that they should be, and would plead for a very much greater consideration of the mother, but there is no insuperable difficulty in their way.

Childbirth in hot climates is said to be a definitely easier process than in temperate countries. This belief is firmly held in Malaya by both mother and doctor. Owing to the higher temperature and the natural tendency to greater relaxation, things are made a good deal easier. I should not be at all surprised if this were really the case, although I know of no adequate investigation of the matter. There is the other side of the picture, of course, that cases of insufficient muscular contraction (inertia) may be more common, but this is usually amenable to treatment.

It may be thought that the isolation from medical attention so frequently found in the tropics would be a drawback. Even in the days of real isolation, however, the materal mortality in country districts was well below that of the cities, as though absence of infectious germs more than compensated for lack of medical attention. In these days of high-speed transport, and particularly as a result of the splendid work of the Inland Mission and Bush Nursing Association, the drawbacks arising from isolation are being rapidly reduced, and the natural advantages of country life being given even further scope.

As regards the period of feeding, here again there is a greater need for consideration of the mother. Her nutritional reserves are being continuously called upon, and, in view of the generally increased stress of hot weather, more consideration must be given to maintaining these reserves and avoiding unnecessary demands upon her. For the nursing mother it is even more important to ensure a plentiful supply of fluid than for other tropical dwellers. Inasmuch as the likelihood of lime and phosphate containing foods being deficient is especially marked in Queensland, every care should be taken to see that these are given in sufficient quantities. Of these foods, milk and cheese are amongst the most important.

The Infant.

Owing to the easier birth process injuries to the infant are less likely to occur. The increasing medical and nursing facilities in the "outback" are removing many of the disadvantages and dangers of isolation. There is no evidence that hot climates directly affect the health of the newly-born infant.

The first twelve months of the baby's life is usually regarded as a special period and termed "infancy," as distinct from childhood which succeeds the first twelve months. During this period the infant is exposed to certain trials and dangers which are much reduced at later times. The death rate is usually greater in these months.

Although there are certain definite trials, such as prickly heat, and dangers, such as gastro-enteritis (summer diarrhœa) occurring in the tropics, the infantile mortality rate for Queensland is no higher than that for the Commonwealth as a whole. Climate, by itself, has no deleterious influence upon the infant death rate. A number of the trials that are introduced by tropical residence can be considerably lessened by careful attention. Loose and light clothing, frequent bathing, generous powdering, all help considerably to minimise that universal

bugbear to both mothers and babies, prickly heat. The careful cleaning and sterlising of all infant food and feeding utensils and the continuance of breast feeding, as long as possible, are powerful weapons against infection. These safeguards must be combined with, and cannot replace, an insistence upon the highest domestic and personal hygiene, with its continued suppression of the fly menace and mosquito nuisance.

Social and Economic Questions.

These are very important and must not be omitted from any practical consideration of such problems as these.

Early marriage is a feature in many isolated communities, and this tendency might easily be reinforced by a tropical climate. On the other hand, marriage is inevitably bound up with economic considerations. We have here several forces at work whose strengths are constantly changing. The whole social background is far from stable and solutions are often sought to-day which would have been socially suicidal even twenty years ago. In this era of flux, it is very unwise to judge or to predict what will be the ultimate outcome. Whatever suggestions are put forward, we must always try to judge them from the viewpoint of the race as a whole and not from the narrow interests of a small group. Even if we find that the good of the race conflicts with our accepted ideas of social conduct, we must be prepared to face the problem. These are questions which can only be solved slowly, although that must not be made an excuse for refusing to face them. Undue haste may be disastrous; the world has suffered often enough from a hot-headed severing of the Gordian knot.

CATTLE FATTENING.

There are thousands of acres of well-grassed land in South-Eastern Queensland on which fattening of bought store cattle is practised. These cattle are usually animals which fatten into "heavies." Older stock can "handle" roughage much better than yearlings, and it takes less time and trouble to get them ready for market; but, in general, they do not give as good a net return as "baby beef."

The reasons are:—

(1) Buying of stores is a more speculative business and the outlay greater.

(2) Disease, drought, and other retarding influences make the money loss, if any, greater.

(3) The trade does not favour "heavies."

(4) Although the relative cost per 100 lb. is higher with the "young stuff," more can be bought for the same money.

(5) The young animal lays on both flesh and fat—i.e., it fattens while it grows.

(6) The trade pays more for the finished carcase.

(7) There is *always* a market for well finished lightweights.

There are certain requisites for turning off baby beeves the year round:—

(1) On the part of the buyer, a sound knowledge of what "good doers" look like;

(2) On the property—well-planned subdivision, improved pastures, cultivation, and fodder conservation.

Improvements require a considerable outlay of capital, but in all cases where management has been sound the returns have made it well worth while.

It should always be remembered that the improvements are permanent, and that they enhance the value of the property.

The Apiary

DURING this month there is rather a lull in brood rearing activities, and some districts may experience a pollen shortage. When this occurs egg laying is curtailed and the colony rapidly dwindles in numbers. Experiments have recently been conducted by a Southern research worker for the purpose of finding pollen substitutes when natural pollen is not available in sufficient quantities to meet the needs of the bees. As a result of this work the following substances have been recommended for trial on a commercial scale:—(1) Cotton-seed meal, either alone or mixed with bran; (2) dried milk mixed with sufficient bran to prevent it caking in the open, and with about one part of cocoa to twenty parts of the other mixture; (3) cotton-seed meal to which is added one part of dried milk to ten of the meal. This Department recommends a trial of the above substitutes and would like to hear from bee-keepers who have tried them out on a commercial scale.

At this period high temperatures usually occur and the comfort of the bees should be considered. If a hot spell of weather comes on and the hives are exposed to the sun, new combs, especially if placed near the sides, will sometimes melt. A well-painted hive is cooler than one not painted, and a shade board would be useful. Temporary protection can also be given with bags or bushes spread on top of the hives.

If a heavy flow is on and the weather very hot, the bees will often "hang out" on the outside of the hive. For those using loose bottom boards the provision of extra ventilation may be effected by raising the hive slightly from the bottom board by means of thin wedges at the entrance. Should the bottom board be fixed, then the covers may be slightly raised to provide extra ventilation. Should the hive, however, be full of honey another super must be provided for additional storage room; these measures will usually induce the bees to commence work again. If any extracting is done in very hot weather the wet sticky combs should not be returned direct to the hive, but stacked on top. They will all be found cleaned up and dry by the next morning, when they may be replaced inside the hive.

PERIOD OF GESTATION OF DOMESTIC ANIMALS AND OF INCUBATION OF POULTRY.

Animals.	Shortest period.	Average or usual period.	Longest period.
	Days.	Days.	Days.
Mare	315	345	360
Ass	365	380	391
Cow	242	285	313
Buffalo	290	310	330
Ewe	145	150	160
Goat	148	155	165
Sow	109	115	143
Bitch	55	60	63
Cat	48	50	56
Rabbit	25	30	35
Hen	19	21	23
Duck	28	30	32
Goose	27	30	33
Pigeon	18	20	21

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

"Purple Tails."

C.E.O. (Theodore)—

Your specimen is *Trichinium semilanatum*, a very common native plant of the amaranth family, *Amarantaceæ*. The only local name we have heard given to it is "purple tails." It is quite common on the plains of Central Queensland and is generally regarded as an excellent fodder. We have not heard of it before as a weed of cultivation.

"Live Leaf."

G.W.V. (Willowburn)—

The specimen is *Bryophyllum calycinum*, the "live leaf" or "liveforever," a succulent plant very widely spread over the subtropical regions of the world. Its native country is not known for certain. It is naturalised in many parts of Queensland, particularly around Marburg. A characteristic of the plant is that the leaves, if laid on the ground, form young plants in the angles of the crenations.

Cat's Head Burr ("Saucy Jack").

Inquirer (Boonah)—

Your specimen is *Emex australis*, the cat's head burr, a native of South Africa and sometimes known as Cape spinach. In South Australia, it is a very bad weed, and is most frequently known as "Saucy Jack." It is not known to possess any poisonous or harmful properties. It has been naturalised in Queensland for some considerable time, but does not seem to have spread here to the extent that it has in the Southern States. It is, however, an exceedingly bad weed in some places, particularly about townships, and every effort should be made to destroy it as soon as it makes its appearance.

Willow Primrose. Milky Cotton Bush.

W.A.K. (Clermont)—

1. *Jussiaea suffruticosa*, the willow primrose. This plant has been suspected of causing trouble among horses once or twice in Queensland, but we have no definite information about it. As far as is known, most members of the family are quite harmless.
2. *Asclepias curassavica*, redhead or milky cotton bush. This plant is a native of the West Indies, but is now spread widely in most warm countries. It is common in Queensland, particularly in coastal districts. It is poisonous to stock, but is rarely eaten in sufficient quantities to cause trouble.

Foam Bark. Scrub Box.

L.T. (Jimboomba)—I am in receipt of several specimens from you. They have been determined as follows:—

1. *Jagera pseudorhus*, foam bark. During the time of the war, the bark of this tree was used as a substitute for quillaja bark for heading beers and soft drinks, but the tree is of very sparse distribution, and the supply was irregular. So far as we know it is not being collected at the present time.
2. *Tristania conferta*, scrub box or brush box. This tree is a native of Queensland and New South Wales. It is planted frequently as a street tree about Southern cities. Nurserymen down there mostly stock it under the name of *Lophostemon australe*. When properly pruned it makes a very shapely and umbrageous head.

General Notes

Staff Changes and Appointments.

Messrs. F. J. Manuell (Brisbane), A. C. P. Nurcombe (Brisbane), W. J. White (Kingaroy), and E. Widdup (Mundubbera), Assistant Graders (Senior), Cotton Section, have been appointed Graders, Cotton Section, Department of Agriculture and Stock.

Messrs. L. A. Burgess (Brisbane), Analyst, and L. E. Nichols (Toowoomba), Assistant to Dairy Bacteriologist, have been appointed Dairy Technologist and Assistant to Dairy Technologist, respectively, Dairy Research Laboratory, Department of Agriculture and Stock.

Mr. J. E. Maher (Ipswich) has been appointed an inspector under the Diseases in Stock Act, the Slaughtering Act, and the Dairy Produce Acts, Department of Agriculture and Stock.

Mr. F. Angus (Fairymead, Bundaberg) has been appointed an honorary ranger under the Animals and Birds Acts, and Mr. J. Waters (Dunwich) has been appointed an honorary ranger under both the Animals and Birds Acts and the Native Plants Protection Act.

Constable F. L. Marsh, the officer in charge of police at Springsure, has been appointed also an inspector under the Brands Acts.

Mr. R. Letters, Rochedale, has been appointed an inspector under the Diseases in Plants Acts, Department of Agriculture and Stock, Brisbane.

Messrs. C. Caswell, E. R. Hollamby, and W. J. Park, slaughtering inspectors, have been transferred from Ipswich to the Oxley Bacon Factory, from Toowoomba to Maryborough, and from the Zillmere Bacon Factory to the Willowburn Bacon Factory (Toowoomba), respectively.

The appointment of Mr. M. Moloney as Acting Inspector of Stock at Meandarra has been cancelled, and the Officer in Charge of Police at Glenmorgan has been appointed Acting Inspector of Stock, Brands, and Slaughtering.

Messrs. J. R. Canty and A. Canty, Inspectors of Stock, have been appointed also inspectors under the Diseases in Poultry Act.

Constables D. Nichol (Dalveen) and A. R. Devantier (Einasleigh) have been appointed also inspectors under the Slaughtering Act.

Mr. J. G. Brooks (Cairns) has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Mr. D. L. McBryde, assistant technologist, Bureau of Sugar Experiment Stations, has been appointed chemist in charge, Sugar Experiment Station, Mackay.

The following transfers of officers of the Department of Agriculture and Stock have been approved:—

Mr. W. H. Bechtel, Instructor in Agriculture, from Atherton to Brisbane.

Mr. A. Hamilton, Instructor in Agriculture, from Mareeba to Atherton.

Mr. E. W. Baird, Field Assistant, from Mareeba to Atherton.

Mr. R. C. Cannon, Instructor in Agriculture, from Dimbulah to Mareeba.

Mr. B. Dunbavand, Inspector of Stock, Slaughtering, and Dairies, from Ingham to Rockhampton.

Mr. A. H. Canty, Inspector of Stock, Slaughtering, and Dairies, from Brisbane to Ingham.

Mr. G. Courtney, Medical Superintendent, Palm Island, has been appointed an honorary ranger under the Animals and Birds Acts and the Native Plants Protection Act.

Constable R. J. Bradfield (Windorah) has been appointed also an inspector under the Slaughtering Act.

Commercial Cane Sugar.

The regulation under the Regulation of Sugar Cane Prices Acts dealing with the determination of commercial cane sugar in cane has been amended and revised, and has received the approval of the Executive Council.

Rural Topics

The Corriedale.

The qualities of the Corriedale as a general utility sheep are not sufficiently appreciated in Queensland. The Corriedale was founded on the Lincoln-Merino cross, from which was evolved this distinct breed which possesses the most valuable characteristics of the best type of dual purpose crossbred. That is to say that when the Corriedale ewe is joined with a Downs ram the breed produces a fleece of high quality as well as a lamb of outstanding merit.

In Queensland, a tendency to produce a sheep too fine in the fleece has been observed in some Corriedale studs. It should be recognised, however, that this tendency, if allowed to persist, will eventually defeat the object for which the Corriedale was evolved.

The Farmers' Feathered Friends—A Plea.

At this time of the year, when birds are nesting, an earnest appeal is made to all to become interested actively in the preservation of wild bird life. The value of birds in our rural economy is incalculable. It has been well said that the service that birds render in protecting forest trees "is more nearly indispensable to man than any other benefit they confer on him. Were the natural enemies of forest insects annihilated, every tree would be threatened with destruction, and man would be powerless to prevent the calamity. He might make shift to save some orchard or shade trees; he might find means to raise some garden crops; but the protection of all the trees would be beyond his powers. Yet this herculean task ordinarily is accomplished as a matter of course by birds and other insectivorous creatures without trouble or expense to man."

During the recent grasshopper plague, many thousands of starlings were to be seen feeding upon the insects, but starlings were not alone in their assault upon the common enemy. Every insectivorous bird fed to satiety on the hoppers. The indiscriminate shooting of bush birds has, therefore, nothing to commend it from any point of view.

Fortunately, very few native birds are not protected legally, but even the despised crow is a friendly ally in the continuous war against insect pests. Crows eat grasshoppers and it takes a lot of hoppers to fill the craw of a crow. The crow also is an energetic scavenger. It eats carrion and maggots. From maggots come blowflies, and the loss to Australian woolgrowers caused by blowfly infestation runs into millions of pounds annually.

Improvements on the Grazing Selection.

Improvements on newly-acquired sheep lands are important from two points of view. Firstly, their place in economic management, and, secondly, the necessity of avoiding the making of improvements likely to over-capitalise the property. A horse paddock is a prime necessity, and should be sufficiently large to run working horses and house milking cows.

If the lie of the land allows it, the horse paddock should be situated as near as possible to the centre of the property. The advantage of this will be found when the selection is stocked. The shorter distances to ride will be appreciated by both man and beast. The fencing should be sheep-proof, and the paddock cleared of unnecessary timber. Fencing the boundary is the next important job. The nature of this fence depends on the conditions under which the land has been selected. It may be that rabbit netting has been specified, and a dog-proof fence may be necessary. In any case, the boundary fence should be the best of its kind. If an addition to the natural water supply is necessary, this should be attended to at once. In this connection, the selector would be well advised to observe the methods adopted in the district. Bores, wells, and surface tanks all have their advantages, according to local circumstances. If the country is naturally watered, the subdivsion fences should be so planned, as far as practicable, that permanent water will be in every paddock. Substantial yards—preferably of post and rail construction—are necessary at the homestead. The yards may be used for both horses and cows. A sheltered calf pen should be attached. If conditions make it necessary, judicious ringbarking is the next job. Consideration should, however, be given to the reservation of tree belts for shade and shelter.

A woolshed and drafting yards on a small property should be close together and conveniently situated. The homestead, and its lay-out, is important, but its cost should be in keeping with the capital value of the holding.

Orchard Notes

FEBRUARY.

THE COASTAL DISTRICTS.

FEBRUARY in coastal Queensland is frequently a wet month, and, as the air is often heavy with moisture and very oppressive, plant growth of all kinds is rampant, and orchards and plantations are apt to get somewhat out of hand. Where green cropping is not practised it is not always possible to keep weed growth in check by means of cultivation. At the same time, the excessive growth of weeds provides a large quantity of organic matter which, when it rots, tends to keep up the supply of humus in the soil, so that, although the property looks unkept, the fruit-producing trees and plants are not suffering, and the land is eventually benefited. When the weed growth is excessive and there is a danger of the weeds seeding, it is a good plan to cut down the growth with a fern hook or brush scythe and allow it to remain on the ground and rot, as it will thereby prevent the soil from washing, and when the land is worked by horse power or chipped by hand it will be turned into the soil. This is about the most satisfactory way of dealing with excessive weed growth, especially in banana plantations, many of which are worked entirely by hand.

The main crop of smooth-leaf pineapples will be ready for canning, and great care must be taken to see that the fruit is sent from the plantation to the cannery with the least possible delay and in the best possible condition. The only way in which the canners can build up a reputation for Queensland canned pineapples is for them to turn out nothing but a high-class article. To do this they must have good fruit, fresh, and in the best of condition.

Bananas for shipment to the Southern States should on no account be allowed to become over-ripe before the bunches are cut; at the same time, the individual fruit should be well-filled and not partly developed. If the fruit is over-ripe it will not carry well, and is apt to reach its destination in an unsaleable condition.

Citrus orchards require careful attention, as there is frequently a heavy growth of water shoots, especially in trees that have recently been thinned out, and these must be removed. Citrus trees can be planted now where the land has been properly prepared, and it is also a good time to plant most kinds of tropical fruit trees, as they transplant well at this period of the year.

A few late grapes and mangoes will ripen during the month, and, in respect to the latter, it is very important to see no fly-infested fruit is allowed to lie on the ground but that it is gathered regularly and destroyed.

Strawberries may be planted towards the end of the month, and, if early ripening fruit is desired, care must be taken to select the first runners from the parent plants, as these will fruit quicker than those formed later. The land for strawberries should be brought into a state of thorough tilth by being well and deeply worked. If available, a good dressing of well-rotted farmyard manure should be given, as well as a complete commercial fertilizer, as strawberries require plenty of food and pay well for extra care and attention.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE marketing of later varieties of peaches and plums and of mid-season varieties of apples and pears, as well as of table grapes, will fully occupy the attention of fruitgrowers in the Granite Belt, and the advice in these notes for the two previous months with regard to handling, grading, packing, and marketing is again emphasised, as it is very bad policy to go to all the trouble of growing fruit and then, when it is ready to market, not to put it up in a way that will attract buyers.

Extra trouble taken with fruit pays every time. Good fruit, evenly graded and honestly packed, will sell when ungraded and badly packed fruit is a drug on the market. Expenses connected with the marketing of fruit are now so high, owing to the increased cost of cases, freight, and selling charges, that it is folly to attempt to market rubbish.

During the early part of the month it will be necessary to keep a careful watch on the crop of late apples in order to see that they are not attacked by codling moth.

If there is a slightest indication of danger, a further spraying will be necessary, as the fruit that has previously escaped injury is usually that which suffers the most.

Fruit fly must also be systematically fought wherever and whenever found, and no infested fruit must be allowed to lie about on the ground.

Grapes will be ready for market, and in the case of this fruit the greatest care in handling and packing is necessary. The fruit should never be packed wet, and, if possible, it is an excellent plan to let the stems wilt for a day at least before packing. This tends to tighten the hold of the individual berries on the stem and thus prevent their falling off.

In the western districts winemaking will be in progress. Here again care is necessary, as the better the condition in which the fruit can be brought to the press the better the prospect of producing a high-class wine.

Where necessary and possible citrus trees should be given a good irrigation, as this will carry on the fruit till maturity, provided it is followed up by systematic cultivation so as to retain a sufficient supply of moisture in the soil.

BOOKS REVIEWED.

"THE STUDY OF THE SOIL IN THE FIELD," by G. R. Clarke, B.Sc., M.A. (Milford, Oxford University Press).

An honest and very successful effort to elucidate those important aspects of pedology, which the soil worker, engrossed with his "post-mortem" examinations, fails only too often to regard in their true perspective. The author has not confined himself to merely indicating the general principles of field soil studies, but has given actual working details, and in this respect Part II. is invaluable to the man on the job. One could wish that the work had not been restricted to a mere 140 pages, for the author could undoubtedly ably demonstrate many more practical points which would be of immense interest to the student.

—*E. H. Gurney.*

"CANNING PRACTICE AND CONTROL," by Osman Jones and T. W. Jones (Chapman and Hall, London, 1937).

The change in living habits which has been ushered in by the general adoption of motor transport is clearly reflected in the modified dietary of the urban dweller. Large joints which allowed of "carry-over" have been replaced by the smaller, leaner, and tenderer cuts from young animals; a greater variety of meats, fruits, and vegetables are obtainable, while farinaceous foods and confections are almost without number.

Apart from improvement in transport, the greatest factor responsible for this change is the advance in food processing technique. To meet the exacting demands which competition, stimulated by the newer knowledge of nutrition, has engendered in the dominant peoples of the world, only the best is good enough. This means careful production of raw materials, rigid selection, scientific processing, accurate control, and scrupulous cleanliness. The farther a country is from its markets the greater the care necessary. In no field is this strict attention to detail more important than in that of canning.

This has been the guiding principle in "Canning Practice and Control," by Osman Jones and T. W. Jones. Both authors are well known—the former as Chief Chemist of C. and T. Harris (Calne) Ltd. and Chairman, Advisory Panel, British Food Manufacturers' Research Association; and the latter as Editor of "Food" and "The Industrial Chemist."

The book is well provided with photographs, and an excellent bibliography ends each chapter. The duties of the chemist and his relation to successful plant operation are clearly defined. Chapters on examination of materials and a general outline of the microbiology of canning will be found most useful by all food-processing factories. A note on the value of air-conditioning with reference to health and efficiency of employees should be of more than passing interest to boards of management.

This book fills a very real gap in the literature on modern food-processing, and it should find a place in the manager's office as well as on the food chemist's shelf.

Farm Notes

FEBRUARY.

REFERENCE was made in last month's Notes to the necessity for early preparation of the soil for winter cereals, and to the adoption of a system of thorough cultivation in order to retain moisture in the subsoil for the use of crops intended to be raised during the season. The importance of the subject, and its bearing in relation to prospective crop yields, is made the excuse for this reiteration.

Special attention should be given to increasing the area under lucerne (broadleaf Hunter River) wherever this valuable crop will grow. Its permanent nature warrants the preparation of a thorough tilth and seed-bed, and the cleansing of the land, prior to sowing the seed, of all foreign growths likely to interfere with the establishment and progress of the crop. Late in March or early in April is a seasonable period to make the first sowing providing all things are favourable to a good germination of seed.

Dairymen would be well advised to practise the raising of a continuity of fodder crops to meet the natural periods of grass shortage, and to keep up supplies of succulent fodder to maintain their milch cows in a state of production.

Many summer and autumn growing crops can still be planted for fodder and ensilage purposes. February also marks an important period as far as winter fodder crops are concerned, as the first sowings of both skinless and cape barley may be made at the latter end of the month in cool districts. Quick-growing crops of the former description, suitable for coastal districts and localities where early frosts are not expected, are Sudan grass, Japanese and French millet, white panicum, liberty millet, and similar kinds belonging to the Setaria family. Catch crops of Japanese and liberty millet may also be sown early in the month in cooler parts of the State, but the risk of early frosts has to be taken.

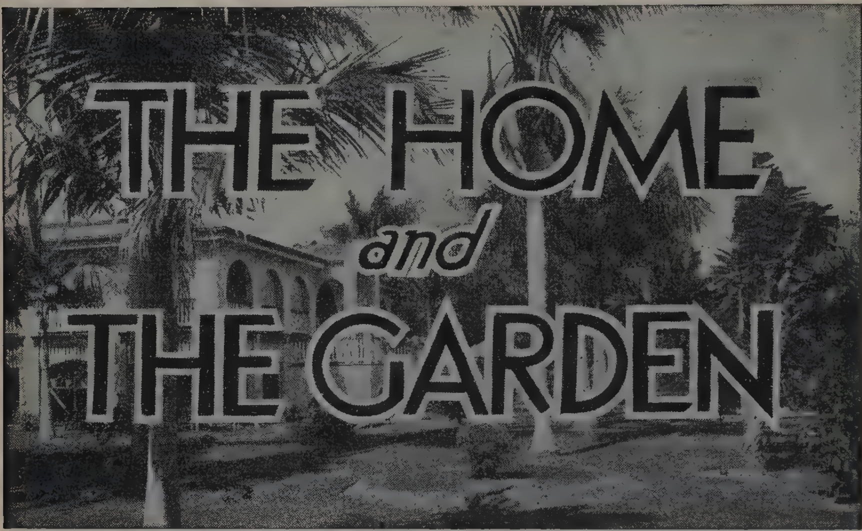
Maize and sorghums can still be planted as fodder and ensilage crops in coastal districts. In both coastal and inland areas, where dependence is placed largely on a bulky crop for cutting and feeding to milch cows in May and June, attention should be given to Planters' Friend (so-called Imphee) and saccaline.

In most agricultural districts where two distinct planting seasons prevail, the present month is an excellent time for putting in potatoes. This crop responds to good treatment, and best results are obtainable on soils which have been previously well prepared. The selection of good "seed" and its treatment against the possible presence of spores of fungoid diseases is imperative. For this purpose a solution of 1 pint of formalin (40 per cent. strength) to 15 gallons should be made up and heated to 125 degrees Fahr. The potatoes should then be immersed in the solution for about two and a-half minutes. Bags and containers of all kinds should also be treated, as an additional precaution. "Irish Blight" has wrought havoc at times in some districts, and can only be checked by adopting preventive measures and spraying the crops soon after the plants appear above the ground. Full particulars on the preparation of suitable mixtures for this purpose are obtainable on application to the Department of Agriculture, Brisbane.

Weeds of all kinds, which started into life under the recent favourable growing conditions, should be kept in check amongst growing crops; otherwise yields are likely to be seriously discounted. The younger the weeds the easier they are to destroy. Maize and other "hoed" crops will benefit by systematic cultivation. Where they are advanced, and the root system well developed, the cultivation should be as shallow as possible conistent with the work of weed destruction.

First sowings may now be made of swede and other field turnips. Drilling is preferable to broadcasting, so as to admit of horse-hoe cultivation between the drills, and the thinning out of the plants to suitable distances to allow for unrestricted development. Turnips respond to the application of superphosphate; 2 cwt. per acre is a fair average quantity to use when applied direct to the drills.

Where pig-raising is practised, land should be well manured and put into good tilth in anticipation of sowing rape, swedes, mangels, field cabbage, and field peas during March, April, and May.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE IMPORTANCE OF MILK.

IT is well sometimes to remember that Australia is only a small part of the world, and that Queensland is only a small part of Australia. It is possible that Queenslanders may have something to learn from what is being said and done in other parts of the world regarding milk. On this question

The League of Nations

speaks with no uncertain voice. "The value of milk is unique. It is indispensable. More than any other food it contains the elements essential for life and growth. It has no satisfactory substitute, and is itself the nearest approach we possess to a complete food. In our opinion one of the most important practical steps that can be taken to raise the standard of health of the growing generation is to arrange for the free or cheap distribution of safe milk to children of school or pre-school age. The health of the child is the kernal of the nutritional problem. The damage done by faulty feeding in the pre-natal period, in childhood, and in adolescence cannot be repaired in later life."

Great Britain.

In our motherland great efforts have recently been made to promote the consumption of milk by children. No fewer than 2,500,000 of school children have been supplied with cheap milk, and another 400,000 with free milk during the year 1936. Large quantities of milk have also been issued to expectant or nursing mothers and to children below school age. Notwithstanding all this, the British Minister of Health recently

issued a strongly worded memorandum to all local authorities urging them to increase and liberalise their provision of milk to the last two classes.

South Australia.

Let us now come nearer home. In 1930, after the onset of the financial depression, a large number of families in Adelaide were living on Government rations. These rations contained a liberal provision of milk for children and expectant or nursing mothers. For seven years this has continued, and at present each mother receives 1½ pints of fresh milk daily, each child up to six years one pint, from six to thirteen years half a pint. A striking improvement in the health of the children followed. It became indeed better than it had been before the depression.

Even more striking has been the reduction in the infant mortality of South Australia. In all the Australian States this mortality in the first year of life has been considerably reduced, largely through the work of infant welfare centres or baby clinics, but this reduction hitherto has not been much in the first month of life. Babies are seldom brought to the clinics before they are three or four weeks old. There has been a large decrease in the number of deaths in the eleven months that follow the first month. The death rate during the first month is due to antenatal causes, which are responsible in Queensland and Brisbane for nearly three-fourths of the mortality in the first year.

If we compare Queensland, which has the next lowest infant mortality, with South Australia, we find that the eleven months mortality of both is nearly equal, but rather less in Queensland; but this advantage is more than counter-balanced by the much lower first month mortality in South Australia. Comparing Brisbane with Adelaide both mortalities are lower in the latter. The difference in the eleven months mortality is small, but that in the first month mortality is considerable. Of every 100 newborns nearly as many die in Brisbane during their first month as in Adelaide during their first year. The first month mortality depends almost wholly on the health of the mother. This again depends very much on how she is nourished, and more particularly on her taking a sufficient quantity of milk daily.

All Australians who are interested in the saving of infant life should very seriously consider the example set by South Australia.

THE ROMANCE OF TREES.

Tree pictures that live in the memory! Can we share them with others whose feelings are similarly stirred by living portraits in Nature's greatest handiwork? Pictures etched against a clear sky with tracery of limb and leaf and flower sublimely fashioned—in colour and form and soft green foliage.

Trees are the noblest of all Nature's creative works. They symbolise our own lives so closely; trials and tribulations resemble our own; early training and fashioning are mutually so important.

But trees are more than all this, as many of us know who have seen the splendid autumn foliage of Liquidambars, the unique flowers of Tulip Trees (Liriodendrons), the spontaneous display of the Cape chestnuts, the soft beauty of Jacarandas, and the blaze of splendour that is the Poinciana Rex.

Others who have warmed themselves at the fiery autumn glow of scarlet which is the Pin Oak or bathed in the beauty of the Turkey oak with its ruby red tones, or been entranced with the dazzling grace and softness of the Silver Birch, know well what the changing glory of the seasons means to us—in the language of the trees.

Autumn is perhaps the most enchanting of all, for then the deciduous trees are radiant in many tones. They certainly go to rest with colours flying when stern old winter is ushered grudgingly in.

Spires of Molten Gold.

Then the spires of molten gold—the poplars—vie with the golden ash—also in golden tones—and the elms, resplendent in rich yellow and the box elders for a place on the stage. Japanese maples—most delicate of all in foliage—are radiant in scarlet tones both during spring and autumn. Their summer coating is a soft verdant green. Even the ruby red of the ordinary pear trees are something to arouse admiration in late autumn.

These, however, are only part-time stories of the beauty of trees. Many other phases of their splendour could be told.

See the bronzy tint of the soft Cryptomerias during the winter and the fairy-like effect of snow along the pendulous branches of the Deodars. See the lovely Pawlownia or Blue Bell Tree—at present in full bloom at Cootamundra. It is only then we begin to understand the "Romance of our Trees."

A few other impressions to flash across the memory-screen are:—Early springtime foliage of elms and oaks; the silky oaks in a blaze of orange; Moreton Bay chestnuts robed in saffron; and weeping willows seen in relief against early winter sunlight.

English Tree Pictures.

Now for some of the tree pictures! It was during the war years, when those of us who were fortunate enough to be in England during springtime saw its real beauty. The war could not stop nature's pageant from unfolding itself. A few of us made the trip to Bushey Park to see the horse-chestnuts of the famous avenue in bloom. A mile of them! It was a sight to remain in the mind of every beauty lover for life. The long racemes of whitish flowers with a creamy centre, like giant candles held aloft, and the trees like candelabra against the hand-like foliage, their soft green flowers stand out in relief. Perhaps it was the massed beauty which counted. We were spellbound.

From here to an avenue of copper beech trees down in Sussex was another treat. To see these beech trees with the rich coppery tint accentuated in bright sunlight was to understand what trees mean to England. The home country is noted for its lawns and trees. No other European nation can quite equal England in these respects—leafy trees particularly.

Perhaps pride of place can be given in our own land to the poplars of Tumut, the oaks and elms in Machattie Park, Bathurst, and Mount Wilson's famous trees, not forgetting the glorious blue gums which grow naturally there. I would not like to decide between these.

Graceful Jacarandas.

I have not had the pleasure of seeing Grafton's Jacaranda Avenue, otherwise it should have the premier place in such pictures—coloured photography has assured me of its glory. But to atone for that omission somewhat, there is a boyhood recollection of Jacaranda trees in the city of Gympie, in Queensland. The residential part of the town is built on a ring of hills, in the central hollow of which is the business section. During late springtime a sublime picture is presented of great splashes of mauve, plentifully besprinkled throughout the green of the trees. These are the jacarandas: trees of beauty and grace.

I have seen many flame trees whose scarlet glory remains etched on my memory, but perhaps the one that is clearest is a magnificent specimen at Gosford. Standing in the police sergeant's residence, it is a beacon to be picked out for miles around when in bloom.

One day at Lindfield I was attracted by a gorgeous mass of purple, which on investigation proved to be Bauhinia purpurea. It was just below the post office—the finest specimen tree I have seen. Its memory remains. A lovely little row of these trees at Point Clare seen since confirms early impressions of bauhinias.

There was an enchanting little Liquidambar tree at Faulconbridge in Mrs. Robinson's garden, which surpassed anything I have since seen for richness of autumn foliage. It was shapely and graceful, too. During one mellow late autumn, free from winds, that tree was a dream-picture.

Along the Gilmore Valley.

Then there was that never-to-be-forgotten year when I drove down Gilmore Valley, near Tumut, in the late autumn. All along the creek the willows—basket and weeping—were shedding their foliage and the dancing sunlight streamed through, lighting up the stems and twigs and yellow leaves with a golden filigree. The poplars and elms and osage-orange trees, too, were silhouetted with gold—against the light—in a mauvy blue atmosphere.

But, perhaps, it is because in the final analysis I am really Australian that the memory of a shapely swamp gum in Blackheath Park is not effaced by any exotic trees. Like a grey phantom in the mountain mist its delicacy of pattern is seen on summer days when the ''mist comes up.'' It has everything that constitutes tree-beauty—graceful form, satiny-grey trunk, and picturesque marking, and is emblematic of our country—hard at times, but irresistible in its attraction.

Those glorious ''gums'' in Bundanoon's gullies follow it closely—Messmates, Yellow Box, and False Messmates. Shapely, grand, and majestic are these three respectively—but soft and restful to city visitors. With them can be bracketed Queensland's lemon-scented gum (*Eucalyptus citriodora*) for warm climates. A tree full of grace and a poem of beauty—and a fit companion to the Silver Birch—the ''Lady of the Woods.''

''Waratah'' in the ''*Sydney Morning Herald.*''

IN THE FARM KITCHEN.

FOR THE AFTERNOON "SMOKO."

Cut-and-come-again Cake.

12 oz. flour	3 teaspoons baking powder
½ teaspoon salt	8 oz. castor sugar
¼ lb. chopped raisins	¼ lb. cleaned currants
¼ chopped candied peel	2 beaten eggs
7 oz. butter	1½ gills milk
Grated rind 1 lemon	Strained juice of 1 lemon

Sift flour with salt and baking powder. Rub in the butter. Add the raisins, then the peel and currants. Mix well. Add sugar and lemon rind, then the beaten eggs diluted with the milk. Beat till well mixed. Stir in lemon juice. Bake in a greased cake tin lined with two layers of buttered paper in a moderate oven for one and a-half hours.

To Vary this Cake.—Add 1 tenspoon mixed spice, ½ teaspoon ground cloves or grated nutmeg, and substitute 3 oz. chopped shelled walnuts for the currants.

Add 2 tablespoons treacle, ½ oz. carraway seed, and 3 oz. chopped dried apricots.

Add 2 oz. ground almonds, substitute ground rice for half the flour, and add cherries and chopped preserved ginger instead of raisins and currants.

Slab Gingerbread.

½ lb. flour	4 oz. castor sugar
2 oz. butter	2 oz. golden syrup
1 beaten egg	2 oz. treacle
½ teaspoon baking soda	1 teaspoon ground cinnamon
½ teaspoon ground ginger	½ teaspoon mixed spice

Milk to moisten.

Grease a baking tin. Heat the butter, syrup and treacle slowly in a saucepan until the butter is dissolved. On no account bring to the boil. Stir in the egg. Sift the flour with the spices, soda and salt into a basin. Add the treacle mixture and enough milk to make a thick batter. Pour into a buttered tin. Bake in a moderate over (350 deg. F.) for about thirty minutes.

To Vary this Cake.—Add ¼ lb. chopped walnuts to mixture.

Add 2 oz. chopped preserved ginger and 2 oz. finely chopped stoned raisins.

Add 4 tablespoons orange or ginger marmalade to batter, but lessen sugar to 2 oz.

Spice Cake.

- ¼ lb. butter
- 2 beaten eggs
- ¾ lb. chopped stoned dates
- Pinch of salt
- ½ teaspoon grated nutmeg
- ¾ gill cold water or coffee
- 6 oz. light brown sugar
- 6 oz. flour
- 3 teaspoons baking powder
- ½ teaspoon ground cinnamon
- ½ teaspoon ground cloves

Sift the flour, salt, baking powder, and spices into a basin. Add the remainder of ingredients. Beat hard for five minutes. Bake in a greased loaf tin for three-quartrs of an hour in a rather hot oven. Cool on a wire rack. Spread with sifted icing sugar, flavoured to taste with rum or vanilla essence.

To Vary this Cake.—Add 2 oz. chopped candied peel and 1 oz. ground almonds.

Marble Cake.

- 8 oz. flour
- Pinch of salt
- 2 small beaten eggs
- ½ oz. cocoa
- 5 oz. butter
- 5 oz. castor sugar
- ½ gill milk

Brush a cake tin, 6 inches in diameter, with butter. Sift the flour into a basin with the cocoa and salt. Rub the butter into the flour with your finger-tips. Stir in the sugar. Make a well in the centre. Mix with the beaten egg and the milk. When well blended, place half the mixture into another basin. Add the cocoa and a few drops of vanilla essence. Place a layer of the white mixture in the bottom of the tin. Cover with the cocoa mixture, then with the remainder of the white mixture. If preferred, place alternate tablespoonfuls of the mixture into the tin from the beginning. Bake in a moderate over for about three-quarters of an hour. Cool on a wire tray.

IN THE FARM GARDEN.

The best of soil is not too good for most vegetables. The situation of the farm garden should be open and sunny. Good drainage and deep and thorough cultivation also are necessary.

In good soil, most vegetables grow easily. The ground should be deeply dug, at least 12 to 15 inches, and broken up well. Keep the top spit of soil on the top, and do not bring the subsoil to the surface in the digging.

Leaf crops, such as lettuce and spinach (or silver beet), require generous preparation with animal refuse to provide humus.

An additional sprinkling of a handful of sulphate of ammonia to the square yard is also recommended. Keep the nitrate of soda for use when the plants are growing. It should be used immediately, or its value may be lost. Blood and bone is an excellent fertilizer to use for leaf vegetables, during preparation, especially in light sandy soils.

Tomatoes do not require very rich soil. A small quantity of cow manure and a light sprinkling of a mixture of superphosphate (two parts) and potash (one part), turned into the soil, about four or five inches deep, is sufficient. It is better to apply a further surface mulching as the flowers appear than to encourage too much leaf and soft growth at the early stages. Tomatoes which are overfed when young often drop the flowers, and are a prey to fungus diseases.

Beans, in spite of popular ideas, do best in a good rich bed, but the animal manure used must not be too fresh. A further addition of the fertilizer recommended for tomatoes will help them to yield well. Lettuce do best if planted no more than 7 inches apart in the rows, and they should be watered generously. Silver beet in the same rich quality beds, in good sunlight, maintains a succession over the whole summer if treated generously.

Dig a bed deeply for beetroot and break it up finely. A warm sunny aspect is best. Give a generous ration of blood and bone where the rows are to be sown, and just turn it in. Sow the seed after soaking it all night, and cover with ¼ inch of fine soil. Water it well. Thin out the resulting seedlings carefully to 7 inches apart, and maintain the watering and cultivation throughout the growing period. Beet must be grown quickly to be at their best.

A bed each of parsnips and carrots is also advisable. These beds must be dug deeply, as for beet, and a mixture of superphosphate and potash (2 and 1) dug in at the rate of a double handful to a square yard. Put it down low. Sow the seed of both these useful crops in rows about 9 inches apart. Sow thickly and cover the seed with nearly an inch of sandy or finely broken soil and press firmly. Water well. Thin out parsnips if too thick, but make the thinning of the carrots a useful one, by utilising the "culls" for soups. The secret of getting parsnip seed to germinate well is to have it very fresh. Old seed is poor seed. No animal manure must be used in preparation for these root crops, or the roots may fork. A bed which had been well manured for a previous crop is often most satisfactory.

Cucumbers, melons, pumpkins, and squash are most easily grown on slightly raised mounds each about 3 feet in diameter. Any manuring that is required should be done on the mounds only. Preparing the whole area which the plant is to cover is sheer waste.

Give a generous ration of old manure, super., and potash, and dig it in well. For cucumbers dig deeply, and make the ground rich. Sow half a dozen seeds on each hill, and retain only two of the pumpkin, melon, or squash, and three of the cucumbers on each, if all germinate. Apple cucumbers are best for home use. Water them well while young.

ABSTRACTS AND REVIEWS.

PRODUCTION OF HERBAGE PLANT SEEDS.

We have received from the Imperial Bureau of Plant Genetics: Herbage Plants the following series of bulletins dealing with the production and collection of seeds of grasses and other pasture plants in various countries:—

Bulletin No. 19—Production of Grass Seed;

Bulletin No. 20—Insects and other Pests Injurious to the Production of Seed in Herbage and Forage Crops;

Bulletin No. 21—The Influence of Climatic Conditions on Type Composition;

Bulletin No. 22—Technique of Grass Seed Production at the Welsh Plant Breeding Station;

Bulletin No. 23—Production of Legume Seed;

Bulletin No. 24—Collection of Native Grass Seed in the Great Plains, U.S.A.

While the bulletins deal chiefly with temperate-area plants—such as perennial ryegrass, cocksfoot, bent grasses, fescues, and red clover—which are not grown for seed purposes in Queensland, information of interest to local farmers is given in connection with seed production of lucerne and of various North American native grasses.

In the United States of America over 80 per cent. of the total seed production of lucerne is in arid and semi-arid regions. The crop is grown under irrigation in the 5-10 inch rainfall areas, dependence elsewhere being placed upon the seasonal rainfall. The method of harvesting with the ordinary mower followed by a rake is condemned as wasteful. A mower with a side delivery buncher or windrow attachment, or the self-rake reaper, is recommended. Threshing direct from the windrow is advisable. The lucerne huller is a very efficient machine, and the grain thresher with lucerne seed screens and recleaning attachments also is satisfactory. The Verification service of the United States Department of Agriculture and the Certification systems of State Crop Improvement Associations provide valuable safeguards to the purchaser of lucerne seed.

The work of the United States Soil Conservation Service in collecting seeds of native grasses for use in connection with the artificial reseeding of pasture lands is of considerable interest to Queensland pastoralists. Seeds of grasses closely related botanically to our blue grasses and of very similar habit have been harvested in huge quantities by means of specially-built power strippers. "These stripper units consist of a rotating spike-tooth cylinder driven by chain and sprocket from the rear wheel of a car chassis. Appropriate changes are made in the steering apparatus to permit driving the car in reverse, the hopper and cylinder units being placed on what would normally be the back of the car chassis." The power stripper is claimed to work satisfactorily on fairly rough country and on grasses of varying height, and 25 acres can be harvested in one day. Over 80,000 lb. of seed of two grasses resembling our blue grasses were collected during 1936. The ordinary combine has been used with considerable success in collecting seed of other grasses resembling wheat in habit.

—*C.W.W.*

Plate 40.

A YOUNG FARMERS' FIELD DAY GATHERING.—Members of the Ravensbourne Local Producers' Association, with the Head Teacher and members of the Ravensbourne State School Project Club assembled at the Queensland Agricultural High School and College, where principles of the science and practice of agriculture and animal husbandry were interestingly demonstrated.

[*Photo.: Donald Findlay.*

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF NOVEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and stations.	Average Rainfall.		Total Rainfall.	
	Nov.	No. of years' records.	Nov., 1937.	Nov., 1936.
North Coast.	In.		In.	In.
Atherton	2·37	36	6·38	0·37
Cairns	3·90	55	2·42	0·94
Cardwell	4·17	65	4·34	2·50
Cooktown ..	2·52	61	1·27	1·91
Herberton ..	2·58	51	3·81	0·36
Ingham	3·81	45	3·52	0·99
Innisfail	6·24	56	13·66	1·47
Mossman Mill ..	4·35	24	7·90	4·28
Townsville ..	1·89	66	1·93	2·48
Central Coast.				
Ayr	1·74	50	4·28	0·12
Bowen	1·27	66	0·75	Nil
Charters Towers ..	1·43	55	2·45	0·82
Mackay	3·08	66	4·33	0·38
Proserpine ..	2·87	34	4·14	0·29
St. Lawrence ..	2·40	66	2·16	1·04
South Coast.				
Biggenden ..	2·77	38	1·94	0·86
Bundaberg ..	2·71	54	1·71	3·34
Brisbane	3·75	85	7·94	1·35
Caboolture ..	3·51	50	10·81	2·41
Childers	2·77	42	1·47	1·74
Crohamhurst ..	4·50	44	11·24	2·60
Esk	3·24	50	3·63	2·27
Gayndah	2·94	66	4·08	0·99
Gympie	3·24	67	6·34	2·25
Kilkivan	2·58	58	3·60	2·50
Maryborough ..	3·21	66	3·97	2·09
Nambour	4·02	41	13·49	2·48
Nanango	2·74	55	4·62	1·81
Rockhampton ..	2·43	66	3·01	2·46
Woodford ..	3·26	50	6·26	2·05
Central Highlands.	In.		In.	In.
Clermont ..	2·01	66	1·64	0·16
Gindie	2·13	38	4·90	0·53
Springsure ..	2·17	68	5·19	0·10
Darling Downs.				
Dalby	2·76	67	7·58	0·78
Emu Vale ..	2·68	41	4·89	1·67
Hermitage ..	2·58	31	..	1·17
Jimbour ..	2·55	49	3·92	0·78
Miles	2·60	52	4·80	1·36
Stanthorpe ..	2·71	64	5·11	1·24
Toowoomba ..	3·30	65	5·02	1·59
Warwick ..	2·62	72	3·43	1·66
Maranoa.				
Roma	2·18	63	1·78	1·50
State Farms, &c.				
Bungeworgorai ..	2·53	22	..	1·03
Gatton College ..	2·79	38	3·34	3·00
Kairi	2·42	21	..	..
Mackay Sugar Experiment Station	2·80	40	2·35	0·35

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—NOVEMBER, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means.		Shade Temperature. Extremes.				Rainfall.	
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·86	84	75	89	16, 20, 23, 18	69	17	127	4
Herberton	..	84	61	92	7	51	17	381	10
Rockhampton	29·95	89	68	99	15	64	11	301	9
Brisbane	30·02	79	64	101	16	58	11	794	17
Darling Downs.									
Dalby	29·99	82	60	98	15	53	10, 11, 23	758	10
Stanthorpe	..	74	55	92	14	48	11	511	14
Toowoomba	..	76	58	96	15	52	11, 26	501	15
Mid-Interior.									
Georgetown	29·86	98	72	105	17	65	12	170	4
Longreach	29·86	99	71	109	15	64	12, 25, 27	157	3
Mitchell	29·95	90	64	105	14	54	22	59	5
Western.									
Burketown	29·83	97	76	105	9	71	27	187	6
Boulia	29·82	100	72	109	14	67	4, 18	36	2
Thargomindah	29·88	93	71	110	14	58	17	5	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	January. 1938.		February. 1938.		Jan. 1938.	Feb. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·1	6·50	5·25	6·47	4·19	5·46
2	5·2	6·50	5·26	6·46	5·9	6·42
3	5·2	6·50	5·27	6·46	6·5	7·37
4	5·3	6·51	5·28	6·45	6·59	8·32
5	5·3	6·51	5·28	6·44	7·51	9·29
6	5·4	6·51	5·28	6·44	8·46	10·28
7	5·5	6·51	5·29	6·43	9·41	11·28
						p.m.
8	5·5	6·52	5·30	6·42	10·36	12·36
9	5·6	6·52	5·30	6·42	11·33	1·40
					p.m.	
10	5·7	6·52	5·31	6·41	12·23	2·36
11	5·8	6·52	5·32	6·40	1·36	3·35
12	5·9	6·51	5·32	6·39	2·43	4·28
13	5·9	6·51	5·33	6·39	3·48	5·18
14	5·10	6·51	5·34	6·38	4·51	6·1
15	5·11	6·51	5·34	6·37	5·51	6·42
16	5·12	6·50	5·35	6·37	6·41	7·21
17	5·13	6·50	5·36	6·36	7·27	7·58
18	5·13	6·50	5·36	6·35	8·9	8·35
19	5·14	6·50	5·37	6·34	8·49	9·14
20	5·15	6·50	5·38	6·33	9·29	9·55
21	5·16	6·49	5·38	6·32	10·5	10·36
22	5·17	6·49	5·39	6·31	10·47	11·20
23	5·18	6·49	5·40	6·30	11·18	..
						a.m.
24	5·19	6·49	5·41	6·29	11·58	12·7
25	5·19	6·48	5·42	6·28	..	12·56
					a.m.	
26	5·20	6·48	5·43	6·27	12·39	1·50
27	5·21	6·48	5·44	6·26	1·24	2·39
28	5·22	6·48	5·45	6·25	2·13	3·38
29	5·23	6·47			3·4	
30	5·24	6·47			3·57	
31	5·25	6·47			4·52	

Phases of the Moon, Occultations, &c.

2nd Jan.	●	New Moon	4 58 a.m.
10th „	☽	First Quarter	12 13 a.m.
16th „	○	Full Moon	3 53 p.m.
23rd „	☾	Last Quarter	6 9 p.m.

Perigee, 15th January, at 12 noon
Apogee, 27th January, at 4.0 p.m.

Mars is fast travelling towards Saturn, and will pass the slowly moving planet on 2nd February.

Mercury, in Sagittarius, will attain its greatest distance west of the Sun on the 20th January, rising 1 hour 47 minutes before it.

On the 29th Jupiter will set with the Sun, and after some weeks become a morning star.

Mercury rises at 4.46 a.m., 15 minutes before the Sun, and sets at 6.25 p.m., 25 minutes before it on the 1st; on the 15th it rises at 3.31 a.m., 1 hour 40 minutes before the Sun, and sets at 5.11 p.m., 1 hour 40 minutes before it.

Venus rises at 4.25 a.m., 36 minutes before the Sun, and sets at 6.16 p.m., 34 minutes before it on the 1st; on the 15th it rises at 4.48 a.m., 23 minutes before the Sun, and sets at 6.34 p.m., 17 minutes before it.

Mars rises at 9.26 a.m. and sets at 10.17 p.m. on the 1st; on the 15th it rises at 9.20 a.m. and sets at 9.50 p.m.

Jupiter rises at 6.53 a.m. and sets at 8.21 p.m. on the 1st, on the 15th it rises at 6.5 a.m. and sets at 7.37 p.m.

Saturn rises at 11.5 a.m. and sets at 11.22 p.m. on the 1st; on the 15th it rises at 10.13 a.m. and sets at 10.29 p.m.

At this time of the year the northern constellations in or near the milky way are seen to greatest advantage. Withal, it will be worth more than a casual glance to compare the colours of the most prominent among the stars. In Orion Alpha Orion's, or Betelgeuse, with Beta, or Rigel; Alpha, it will be seen, is of a deeper and richer tone than any other orange-tinted star while Beta will show glints of bright-blue.—Aldebaran in the V-shaped group and below it Capella near the northern horizon, Castor and Pollux and Procyon in the north-east are ruddy-hued, orange or gleaming-white, while Sirius scintillates like a diamond in all colours.

8th Feb.	☽	First Quarter	10 33 a.m.
15th „	○	Full Moon	3 14 a.m.
22nd „	☾	Last Quarter	2 24 p.m.

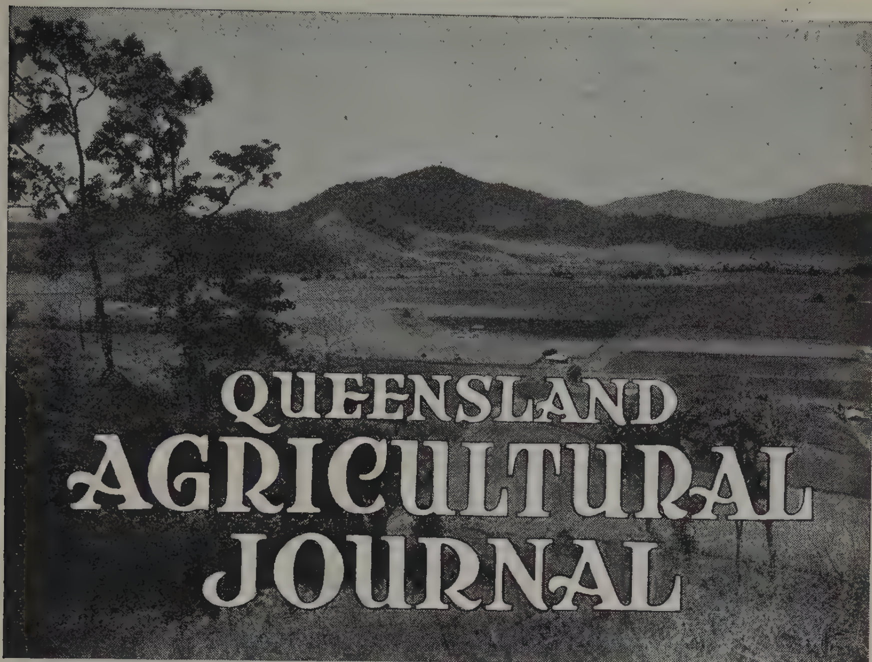
Perigee, 12th February, at 4.0 p.m.
Apogee, 24th February, at 11. 0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



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Event and Comment

Animal Health.

SOME of the methods of dealing with disease in stock used by the State veterinary services were discussed by the Minister for Agriculture (Mr. Frank W. Bulcock) in the course of a recent address to Brisbane Rotarians. He said that at first glance the matter of animal health was the concern solely of sheep and cattle men, but, in reality, it was one which affected the prosperity of the whole State. The extent to which preventive veterinary practice could be applied, and its influence on the economy of the pastoral industry, was revealed by current statistics.

Originally the Council of Scientific and Industrial Research and State Departments had worked separately, but now practically complete co-operation between Commonwealth and State authorities in matters pertaining to animal health had been achieved. The major cause of economic loss in the sheep industry was the blowfly, and he expressed the opinion that until the agricultural research worker received a reward commensurate with his importance in the community and at least comparable with that obtained in commercial callings, there would be a lag in the discovery and application of remedial measures. Brains had to be paid for, and results could not be obtained unless the right men were appointed and paid in accordance with their worth to the community. Research showed fifty years ago that the tick was not really the cause of tick fever, as had hitherto been suspected. A satisfactory means of reducing mortality in cattle from this cause had been found, but complete immunity had yet to be discovered.

Describing the extent and availability of the veterinary services of his Department to the man on the land, Mr. Bulcock quoted a recent instance of the notification by a studmaster of the outbreak of a mysterious disease among his rams. From the minute details supplied, anthrax was suspected. A mobile veterinary unit was despatched immediately from the Department, and the disease was quickly diagnosed as blackleg. The fact that a mobile laboratory could be sent and the flock inoculated without delay had no doubt prevented the disease from spreading, thus saving serious loss to the pastoral industry.

Similar services, the Minister added, were available to the dairy industry. Testing cattle for tuberculosis was going on day after day throughout the dairying districts of the State. Dealing generally with the veterinary activities of his Department, he stressed that they involved not only the improvement of the conditions of animal husbandry, but also contributed vastly to the maintenance of public health.

Queensland's Future.

"I CAN see a tremendous future for Queensland. You have so much natural wealth here that with a well-directed policy you could make tremendous strides and increase output in all directions." Dr. Hugh Dalton, M.P., chairman of the National Executive of the British Labour Party, with that expression of opinion in the course of an interview prefaced a very interesting commentary on what he had observed as a visitor to the State.

Dr. Dalton said that he had had glimpses of the forestry, sugar, agricultural, and cattle industries during his brief stay, and he had been very impressed with what he had seen. He was astonished to see the great variety of crops and fruit that could be grown in Queensland by white labour, and he was amazed at the standard of health and prosperity here.

"I was very inpressed with the way your Government has taken hold of the situation and is planning the development of the State with the standard of living of the people a primary consideration," Dr. Dalton stated.

"You don't want coloured labour, but well-paid, efficient white labour. The labour in Queensland is very efficient, and I was struck with the efficiency and fine physique of the workers."

Referring to the overseas marketing of our products, Dr. Dalton said that the Labour Party in Great Britain liked the idea of bulk purchasing. By bulk purchasing and planned trade he thought there could be a big increase in the trade between Australia and Great Britain.

"By planned trade I do not mean either free trade or protection," he added. "A protective tariff is put on owing to the requirements of particular interests, but without being worked into a framework of public policy and planning in the community interest. Planned, organised exchange of goods . . . . there is great scope for that.

"I would like to see a big growth in the exports of chilled beef from Australia. It would be better from the point of view of developing the British Commonwealth of Nations if Great Britain were to get more chilled beef from Australia than from sources outside the Empire."

Dr. Dalton is a keen believer in reafforestation, and a great supporter of the Forestry Commission which was set up in Great Britain in 1919 to acquire land and plant softwood. He was very impressed, he said, by his visit to the State forests at Beerwah.

Pine trees grew much faster in Queensland than in other parts of the world, and he thought there were great possibilities for commercial reafforestation in this State. He thought that there would be a good market for all the softwoods that could be grown here, and there seemed to be considerable areas of land in the Beerwah district, and no doubt in other parts of the State, which were suitable for the planting of softwoods. The market for Queensland cabinet timbers was expanding rapidly in Great Britain, and they were being used for a great variety of purposes. He expressed the opinion that forestry operations in Queensland were being carried out in a very scientific way.

Empire Trade.

MORE imaginative publicity for Australian produce in London and experiments in bulk trading between organisations set up in the two countries were suggested by Dr. Dalton in a subsequent address to State and Federal members of Parliament and other guests at a luncheon at Parliament House.

Dr. Dalton was welcomed by the Governor (Sir Leslie Wilson) and the Premier (Hon. W. Forgan Smith), who paid a tribute to Dr. Dalton as a scholar and a distinguished member of the House of Commons.

Dr. Dalton said he could be depended on as a firm advocate of the interests of Queensland and Australia generally in the British Parliament and the United Kingdom.

In the House of Commons in 1924 he had voted in favour of increasing the margins of preference on Empire products, including sugar, dried fruits, wines, and tobacco. Ever since he had been trying to get his money back by getting an Empire tobacco he could smoke with enjoyment, and he had done his best with Empire wines.

Empire wines were of a high quality, but their merits had not been made known to the extent warranted by their quality.

Referring to travel between Australia and England, he said he could not see why there should not be a speedier service by smaller, faster, simpler, and less luxurious ships. If people could get across in less time on a simpler menu it would be a great improvement. Much of the Empire's future depended on whether communications could be made faster. That had been accomplished to some extent by air services, but the more democratic sea travel had not improved correspondingly. Not only would sea travel have to be faster, but the cost would have to be brought down so that it would be easier for people to travel.

Dr. Dalton expressed appreciation of the kindness and hospitality he had received in Queensland. He had been particularly pleased to renew his acquaintanceship with the Premier, who had carved an outstanding name for himself in England, where he was looked upon as a great Queenslander, a great Australian, and a great Britisher.

The Varieties of Guinea Grass *(Panicum maximum)* Cultivated in Queensland.

C. T. WHITE, Government Botanist.

GUINEA Grass, which, as its name indicates, is a native of tropical Africa, is probably the most extensively cultivated grass for grazing and cutting throughout the tropical regions of the world. It has never become an important fodder grass in Queensland in the same way as Rhodes, Paspalum, Kikuyu, and a few others, though it has always been known that stock are extremely fond of it. The reasons for its limited use have probably been the difficulty of establishing the grass from seed, and the necessity for cultivation before planting. The ordinary form is perhaps more suitable for cutting than grazing, and under grazing conditions has the reputation of tending to disappear in a short time.

What we regard as the ordinary or common form of Guinea Grass has been cultivated in Queensland for many years, and occurs wild in many places, especially in vacant allotments, and as a weed of coastal fruit farms, &c. During the past few years several strains of this grass have been introduced, and two of these are very different from those previously grown here, and show, I think, a decided improvement on the ordinary form, particularly the one known as Green Panic or Slender Guinea Grass. This form would probably lend itself to establishment in newly burned country in somewhat the same way as Rhodes or Paspalum.

COMMON GUINEA GRASS (Panicum maximum).

This is a tall grass, in favoured circumstances attaining a height of 9 feet. The seed heads are from 9 inches to over a foot in length, and much the same across. They are spreading with a number of slender branches. The spikelets (''seeds'') are pale-green in colour, sometimes with a purplish tinge. They are borne in great abundance, are about an eighth of an inch long, and consist of a short outer rounded glume about one-quarter the length of the spikelet and two longer inner glumes or lemmas loosely enclosing the grain. Though seed is produced in great abundance, the percentage of fertility in commercial samples tested by this Department has been very low.

DESCRIPTION OF PLATE 41.

GUINEA GRASS (*Panicum maximum*).

A.—Seed head of Guinea Grass (*Panicum maximum*), half natural size.

B1.—Base of leaf and top of leaf sheath of Common Guinea Grass (*Panicum maximum*), natural size.

B2.—Single spikelet of Common Guinea Grass (*Panicum maximum*) x 10.

C1.—Base of leaf and top of leaf sheath of Green Panic or Slender Guinea Grass (*Panicum maximum* var. *trichoglume*), natural size.

C2.—Single spikelet of Green Panic or Slender Guinea Grass (*Panicum maximum* var. *trichoglume*) x 10.

D1.—Base of leaf and top of leaf sheath of Purple-topped Guinea Grass (*Panicum maximum* var *coloratum*), natural size.

D2.—Single spikelet of Purple-topped Guinea Grass (*Panicum maximum* var. *coloratum*) x 10.

Plate 41.
GUINEA GRASS (*Panicum maximum*).

GREEN PANIC OR SLENDER GUINEA GRASS (Panicum maximum var. trichoglume).

According to a letter from Mr. C. E. Hubbard, of the Royal Botanic Gardens, Kew, England, one of the leading authorities on the botany of the world's grasses, this variety occurs in Africa from Tanganyika Territory, southwards to Bechuanaland, Southern Rhodesia, and Portuguese East Africa. He further states that it differs from the ordinary type in having hairy spikelets, which are shown in the accompanying illustration; like those of the type, they are pale-green in colour, sometimes with a purplish tinge. Some botanists do not recognise this variety, but so far as we have observed in Queensland it seems very distinct from the type in general habit It is a very much finer grass than the normal form, and would probably lend itself freely to establishment in fresh burns. It is much less cany and would probably better stand regular grazing and periodical feeding-off. The percentage of fertility in stored seed is said to be higher, but on this question I have had no personal experience. This particular variety was introduced by the Department of Agriculture and Stock some time ago and grown in experimental plots in different places in North Queensland, and at Lawnton. It is suitable for growing along the whole of the coastal and near-coastal belt, as I have seen excellent stands of it about Brisbane, especially on the property of Mr. W. R. Petrie, at Petrie, North Coast Line.

PURPLE-TOPPED GUINEA GRASS (Panicum maximum var. coloratum).*

I am calling this variety *coloratum*, as it was introduced into Queensland originally under the name of *Panicum coloratum*. The true *Panicum coloratum*, however, is a very different plant. The present variety differs from the normal form in the leaf being clothed with long hairs, particularly long and dense at the base of the sheath and at the mouth of the sheath and base of the leaf blade. The spikelets when ripe are of a dark purple colour. It is a very robust grass and markedly different in general appearance in the field from the ordinary form. This grass has not been cultivated as far as I know away from a few experimental plots, and we have no information as to its fodder value or behaviour under grazing and cutting as compared with the ordinary Guinea Grass and Green Panic. At one time it was grown in Queensland under the name of Red Buffel Grass, and was probably imported from Africa under this name, as Guinea Grass is sometimes known there as Buffel or Buffels Grass. This name is not to be encouraged, as the name Buffel or Buffels Grass is more generally applied to a different group of grasses in the genus Cenchrus. They are low grasses, mostly 1 to 2 feet high, and have become well established in parts of the Northern Territory and North-Western Australia. They are comparatively rare in Queensland. They in turn are not to be confused with Buffalo Grass, *Stenotaprhum secundatum.*

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* I cannot find that this varietal name has been published before. By the International Rules of Nomenclature it should be described in Latin:—*Panicum maximum* Jacq. var. *coloratum*, var. nov. *Gramen robustum ad. 3m. altum. Folia pilis albis longis obsita, pilis adbasem vaginarum et ad basin laminarum longioribus et densioribus. Spiculæ atropurpuræ.*

Queensland: Lawnton, near Brisbane (cultivated in experimental plot, Department of Agriculture and Stock). F. B. Coleman, No. T. 167, March, 1932 (Type of the variety).

Wild Sunflower—A Plant Poisonous to Stock.

COMMONLY known as wild sunflower, *Verbesina encelioides*, a hardy annual, grows in the Maranoa, Darling Downs, and Lockyer districts. At the end of dry periods it is often seen in patches of several hundred plants on vacant pieces of ground. It has frequently been suspected of causing mortalities in both sheep and cattle.

It recently came under suspicion in the Pittsworth district, where it was suspected of causing the death of a number of cattle which had been grazing on an area where the plant was growing in abundance. The most noticeable lesion was a definite pneumonia with marked oedema of the lungs.

It would appear that the plant is not readily eaten by stock. It is woody in nature, and not palatable, and is therefore more likely to be consumed during periods of dry weather when other feed is scarce.

Through the assistance of Mr. P. Round, the Pittsworth Stock Inspector, a quantity of material was obtained from the Mount Tyson district.

Feeding and Drenching Experiments.*

A. *Guinea pigs and rabbits* were first tested. After starving they were given various quantities of the leaves cut up into small portions. They did not take this readily, though starving. The plant was then mixed with various quantities of bran, but the animals still refused to eat the mixture, except when large quantities of bran were used. Owing to this method proving unsatisfactory feeding tests with these animals were not continued.

B. *Sheep.—Wether No.* 104, full mouth, in good condition.

This animal was first starved for twenty-four hours, and then fed with small quantities of leaves cut up into little pieces. They were not relished, and over a period of three days only about half a pound was consumed. Attempts were made to induce the animal to eat the plant mixed with bran, but it was refused.

A watery extract obtained by grinding up 1 lb. of stalks and leaves, then damping overnight and extracting in a press next morning, was administered after twenty-four hours' starvation. The result was negative. Further amounts of extract were obtained in the same manner using 2 lb. of leaves and administered on each of two occasions after starving overnight. Again the results were negative.

Wether No. 105.—Full mouth, good condition.

Starved for twenty-four hours and then drenched by the stomach tube with 1,500 ml. of watery extract obtained by mincing 2 lb. of leaves and then standing overnight in a basin with sufficient water added just to cover the minced plant. The animal appeared normal during the

* Feeding tests conducted at Animal Health Station, Yeerongpilly. This work was carried out under the aegis of the Poison Plants Committee of the Department of Agriculture and Stock. Funds for this purpose have been provided by the Australian Wool Board.

day, but died overnight. Post-mortem showed little change in the intestinal tract, but there was a distinct pneumonia. The lungs were engorged, the blood vessels being distended except at the apical lobes. There was diffuse oedema throughout, being particularly noticeable in the interlobular tissue. Gelatinous oedema was marked around the bifurcation of the trachea. Between 2 to 3 pints of blood-stained fluid were present in the pleural cavity.

Wether No. 107. Full mouth, in good condition.

This sheep was, after starving for twenty-four hours, drenched with a watery extract obtained from 1 lb. of leaves of old plant. The result was negative. A few days later it received watery extract from 2 lb. of leaves from the mature plant, and nine days later a further watery extract obtained from a further 2 lb. of the young plant. The results were negative.

Wether No. 106. Full mouth, in good condition.

After starving this sheep received the watery extract from 1 lb. of the young plant. The results were negative. Three weeks later it was again starved for twenty-four hours and drenched with the watery extract obtained from 2 lb. of the young plant. The result was again negative.

The conclusions, however, are that the plant is definitely toxic to sheep, producing a typical type of pneumonia associated with congestion and oedema, which is particularly marked in the interlobular tissue.

C. Bovines. Bovine 174. A red shorthorn steer about 2 years old, in store condition.

It was first drenched by the stomach tube without previous starvation with the watery extract obtained from 2 lb. of mature plant (about 2 litres). The result was negative. Over a period of three weeks it was drenched after previous starvation on four occasions with the watery extract obtained from 4 lb. of the mature plant. On the first occasion 4 lb. of the leaves were just damped before being pressed out. On the second occasion the 4 lb. of seed heads and leaves were soaked overnight and then pressed out, and on the third occasion when 4 lb. of seed heads and leaves were again soaked overnight. Administration in each case was after twenty-four hours' starving. On the last and fourth occasion 4 lb. of seed heads and leaves were soaked overnight, and then after pressing out given after forty-eight hours' starvation. The results were negative.

Conclusions.

1. *Verbesina encelioides* is definitely poisonous.

2. It produces a characteristic pneumonia with marked congestion and oedema, which is particularly noticeable along the interlobular septa.

3. Animals vary in their susceptibility to the plant.

4. The characteristic lesion seen in the lung is identical with that observed in natural cases.

Cattle Lice.

W. 24 8/6

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

THERE are few districts in Queensland where lice are not serious on cattle at some time or other, both dairy and beef cattle of all ages being affected. The pests are most troublesome during the winter and spring when the pastures are dry and the animals poor in condition. Heavy infestations may be present also at other times of the year, and in such cases are associated either with drought or general unthriftiness. Again, animals which are stabled for any considerable length of time may carry large numbers of lice. The conditions under which lice become serious are not fully known, but are thought to be concerned with the animals' health. It is known, for instance, that the large numbers which are seen during dry seasons dwindle to insignificant proportions shortly after good rains have fallen.

Lice feed upon the tissues of the host. They cause considerable irritation, and to relieve this the animal scratches and rubs itself against any convenient object. As a result there is a marked loss of hair, the skin becomes scaly, and large sores and scabby areas appear. Cattle are unable to feed and rest to the normal extent. The final effect is a loss of condition, which at times can be severe. The infestations are all the more serious as they usually occur during dry times, when cattle find it difficult to secure sufficient nourishment for their own bodies without feeding large numbers of lice as well. Lice, by lowering the vitality of an animal, also render it more susceptible to inclement weather and to other diseases. Thus the damage and loss caused by lice are sufficiently serious to warrant careful consideration and the application of proper treatment.

SPECIES OF LICE.

Five species of lice are found on cattle. Four of these—namely, the buffalo louse (*Hæmatopinus tuberculatus*), the short-nosed louse (*Hæmatopinus eurysternus*), the long-nosed louse (*Linognathus vituli*), and the tubercle-bearing louse (*Solenopotes capillatus*)—are sucking lice. Sucking lice have a pointed head. The mouthparts are terminal in position, and are tubular to enable the insect to pierce the skin and suck up the blood and fluids on which it lives. The fifth species is a biting louse (*Bovicola bovis*). Biting lice have a broad, squarish head. Their mouthparts are built only for biting and chewing, and are placed on the under surface of the head. Biting lice live on the scales, scurf, and other material which is found on the skin surface.

Sucking Lice.

The Short-nosed Louse.—Of the four species of sucking lice, the short-nosed louse (Plate 42) is the most prevalent and most serious. It is a comparatively large louse, up to $\frac{1}{8}$ of an inch in length. The head is about as broad as long, and the three pairs of legs are all about equal in size. When alive the head and thorax are yellow-brown in colour, and the abdomen a greyish-blue. The short-nosed louse has a very wide distribution, and is the louse most usually found on grown cattle.

The Buffalo Louse.—The buffalo louse, which is found normally on the Indian buffalo, is known to occur on cattle only in the Gulf districts,

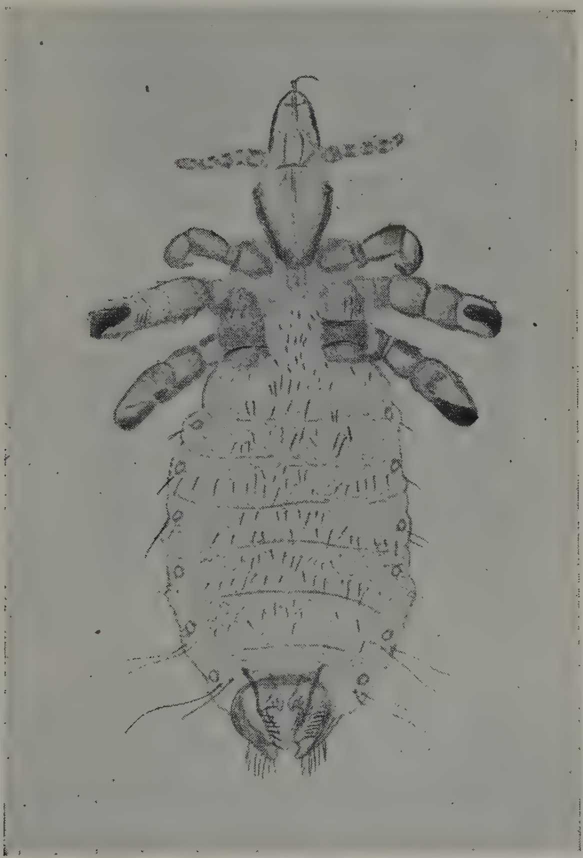
[*I. W. Helmsing.*

Plate 42.

The Short-nosed Louse (*Hæmatopinus eurysternus*) × 48.

and it is doubtful if it is to be regarded as serious. This species is very similar in general appearance to the short-nosed louse, from which it can be distinguished only by microscopic examination.

The Long-nosed Louse.—This species (Plate 43) is next in prevalence and importance to the short-nosed louse. It is usually found on young cattle, but is by no means uncommon on grown animals, especially dairy cattle. It has the same general colouration as the short-nosed louse, but is smaller and more slender in appearance. The head is long and narrow, being much longer than broad, and the forelegs are smaller than the middle and hind legs.



[*I. W. Helmsing.*

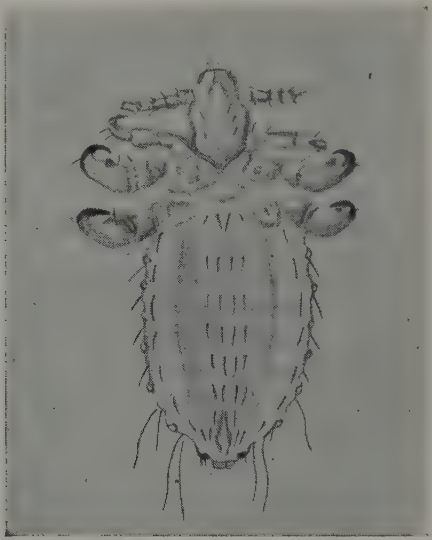
Plate 43.

The Long-nosed Louse (*Linognathus vituli*) × 48.

The Tubercle-bearing Louse—This louse gets its common name from the position of the abdominal spiracles or breathing pores, which open on small laterally placed tubercles (Plate 44). It is the smallest of the sucking lice, and is only about half the size of the short-nosed louse. It has a short, bluntly-rounded head, and, as in the long-nosed louse, the forelegs are smaller than the middle and hind legs. This louse is

probably a comparatively recent introduction into Queensland, but is now well distributed over the southern part of the State.

Habits and Life History.—Sucking lice feed in groups or clusters and are usually found on the top of the head, around the eyes, on the neck, brisket, withers, rump, tail, inside the thighs, and on the scrotum or udder. The most favoured sites are those from which the animal has most difficulty in dislodging them. Their habit of feeding in groups, and the fact that they feed by piercing the skin, make sucking lice more serious than biting lice.



[*I. W. Helmsing.*

Plate 44.

The Tubercle-bearing Louse (*Solenopotes capillatus*) × 48.

The female louse attaches her eggs or "nits" to the hairs of the coat, usually low down near the skin. The eggs of the short-nosed louse hatch in eleven to eighteen days. The young lice differ from their parent chiefly in size, and in about twelve days after hatching are mature and commence laying eggs. In the case of the long-nosed louse, the eggs hatch in ten to fourteen days, and eleven days later the lice are mature. Details of the life histories of the buffalo louse and the tubercle-bearing louse are unknown.

Biting Lice.

The biting louse (Plate 45) is not uncommon, but is neither as prevalent nor as important as either the short-nosed or long-nosed species. It is a small louse, with a broad, blunt, reddish head and a yellowish-white abdomen. The shape of the head readily distinguishes it from the sucking lice. It may occur on cattle of all ages, and is commonly seen on dairying stock.

Habits and Life History.—Biting lice are found most commonly on the top of the head, on the neck, shoulders, withers, along the back, hips, and rump. As mentioned before, they are not as serious as sucking lice, but when sufficiently numerous may cause sores, on which the pests concentrate. The eggs, which are glued to the hairs, hatch in about nine days, the young lice reaching maturity about fourteen days later.

[*I. W. Helmsing.*

Plate 45.

The Biting Louse (*Bovicola bovis*) × 48.

TREATMENT AND CONTROL.

Lice live and breed only upon the body of the animal. Occasionally they may become detached from the host, in which case biting lice are said to live as long as seven days and sucking lice about four days. Eggs which become detached may hatch even after twenty days, and the young lice that emerge may live as long as three days. It is possible, therefore, that there is a risk of infestation from yards and stables which have held lousy cattle; but the chief manner by which lice spread is undoubtedly by contact. By treating infested animals with fluids which kill the lice, the infestations can be controlled and, if the treatment is carefully carried out, completely eradicated.

Treatment may be applied either by washing, spraying, or dipping.

Spraying and Washing.—This method of treatment is practicable only when small numbers of animals are concerned, such as dairy herds and stud cattle. Nicotine sulphate is an excellent fluid for this purpose.

It is used at the rate of 5 cubic centimetres (almost 2 teaspoonfuls) to a gallon of water. *Nicotine sulphate is a very poisonous drug and the greatest care should be taken when handling it.* The drug should contain 40 per cent. or thereabouts of nicotine, and should not be used in any stronger proportions than that advised. The diluted solution can be applied with equal effectiveness either by washing with a rag or brush or by means of a spray pump. Two gallons of the mixture suffice for average-sized animals. Large animals may require 3 gallons.

Dipping.—It is generally recognised that the arsenic-soda dipping fluid used against cattle tick is not very effective against lice. There is reason to believe, however, that if cresylic acid is added to this dipping solution at the rate of 1 gallon of cresylic acid to every 400 gallons of dip, good results may be expected. The formula for such a dip is:—

Arsenic	8 lb.
Caustic Soda	5 lb.
Cresylic Acid	1 gallon.
Water	400 gallons.

The arsenic, soda, and water are prepared first, using 2 lb. of soda for every 8 lb. of arsenic, and the dip made up to the required quantity as for cattle tick. The cresylic acid is then added in the following manner:—*For every* 400 *gallons* of the prepared dip, dissolve 3 lb. of caustic soda in 3 gallons of water and add 1 gallon of cresylic acid. Add the cresylic acid slowly, stirring all the while. This solution is then added to the dip, which is thoroughly agitated to secure an even solution of the cresylic acid.

Should, however, the dip be already charged with arsenic and soda, it will be necessary to add only the cresylic acid solution prepared with caustic soda as above. The addition of cresylic acid does not affect the efficiency of the dip against cattle tick.

While spraying or dipping may be depended upon to kill the lice, *it is important to remember that these fluids have little effect upon the eggs;* consequently, if only one treatment is given, animals remain clean only until lice emerge from the eggs which have not been killed by the dip. A second treatment is thus given after such an interval as will permit all eggs not killed by the first treatment to hatch, but not sufficiently long to allow the young lice to mature and lay further eggs. The interval between treatments is fourteen to sixteen days. Sometimes a third treatment may be necessary. If these recommendations are properly carried out, lice may be completely eradicated.

The best time to dip is during the autumn or early winter, thus sending the cattle into the winter free from lice. The muster should be as complete as practicable, as any lousy animals that escape treatment can readily reinfest the rest of the herd. The beneficial effects of autumn dipping may be summed up in the words of a grazier whose cattle had suffered very severe infestations for many years, but who in the autumn of this year dipped twice—that "although the winter rainfall was well below average, the cattle wintered better than ever before."

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture, and Chief Inspector of the Banana Industry Protection Board.

[*Continued from page* 57, *January*, 1938.]

HOLING AND PLANTING.

STEEP hillsides being the usual location for establishing banana plantations, the important work of holing and planting is by no means easy. On the contrary, it involves heavy labour, such as digging holes in awkward situations, levering out big and obstinate stones, and carrying bags of plants for distribution along each new row. Naturally, the cleaner the ground surface after the burn, the easier this work becomes.

The planting distances adopted more or less generally throughout Queensland are 10 feet by 10 feet or 12 feet by 12 feet apart for the Cavendish variety, and 12 feet by 12 feet or 14 feet by 14 feet for Mons Marie. Sugar bananas are planted 14 feet by 14 feet, while Lady's Fingers, because of their height and particularly vigorous growth, are spaced from 14 feet by 14 feet up to 18 feet by 18 feet apart. The aim is to get the lines of plants as straight as possible up and down hill, and this is accomplished by running a reasonably straight line across the lowest section of the cleared land and another across the highest portion.

If the area of land to be planted is too great, or the steepness of the grade will not allow a sight to be taken from one line to the other, additional cross-lines at convenient intervals would have to be run. Measure off each line, driving a sighting stick into the ground at every 10 feet, or whatever other distance is required. The sighting sticks are handiest if cut about 6 or 7 feet long, sharpened to a good point at one end, and with a piece of newspaper about 1 foot wide bound around the other end to present an easily distinguishable mark when sighting through. Having a supply of these "sighters," one man proceeds to place a stick at about every 5 chains up each row, while a second man sights from the lowest stick to the highest, thus keeping the line quite straight. To save cutting too many sticks, sight five rows at a time, moving the sighters over as one works across.

Next cut a long, thin stick for each man engaged in holing-out. This is used as a measuring rod, and should be cut to measurement—i.e., 10 feet, 12 feet, &c., as the case may be. Starting from the lowest "sighter," the first hole is dug. When completed sight the line, placing the measuring stick from the middle of hole just dug straight up the line. The other end of the stick denotes where the centre of the next hole should be, and so on.

A mattock is the best tool for holing-out, but the blade must be kept strong, long, and sharp. A reinforced blade is often preferable to a new mattock on account of its additional strength. In any case, at least a 5-lb. mattock is needed for this work. The hole need not be made quite symmetrical, but should be at least 18 inches square by 15 inches

Plate 46.

NEWLY BURNT-OFF SCRUB LAND READY TO HOLE-OUT.—Note row of Lady's Finger bananas planted as a break-wind in background.

Plate 47.

NECESSARY TOOLS FOR USE IN HOLING-OUT.—(1) 12-inch flat file. (2) Cane Knife for trimming plants. (3) Crowbar. (4) Draining Spade for removing suckers (plants) from the parent stool. (5) Long Handled Shovel. (6) Mattock.

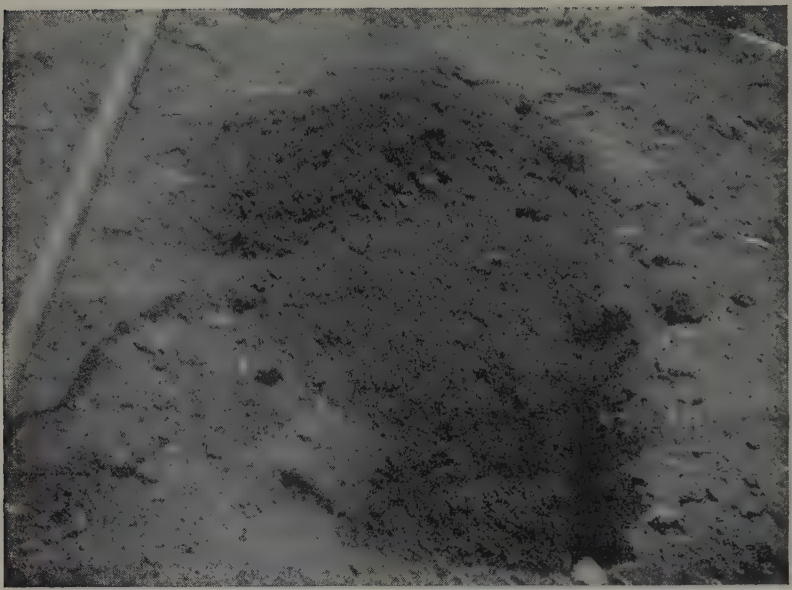


Plate 48.
Looking down into a newly-opened banana hole.

Plate 49.
Showing necessary mound on lower side and size of newly-opened banana hole.

deep. The larger the hole, the greater the quantity of well-broken-up soil which can be filled in around the young plant, thus enabling the young roots to get a good start. In digging holes for bananas, the earth as removed should be drawn to the lower side, making a small mound, for by so doing erosion from around the young plant is prevented. (See Plates 48 and 49.)

Occasionally big stones which are difficult to remove are met with. Where stones can be taken out without undue loss of time, a crowbar is the best tool to use. If too large to shift without very much trouble, it is better to dig the hole a little above or below the stone, whichever is more suitable.

Some growers use a crowbar, mattock, and shovel for holing-out, but as the use of a shovel has a tendency to make the hole similar to a post-hole, with straight sides and a smooth, hard bottom, the method is not recommended. By using a mattock only, the sides of the hole are made somewhat sloping and irregular, and the bottom of the hole is broken and covered to a varying extent with well-broken soil.

The plants are usually carried in corn-sacks from the parent plantation, and finally deposited within or adjacent to the new area. The bags should be opened, plants tipped out, and a final inspection made of the material before planting. Any diseased, weak, or faulty plants should be destroyed. Then, again using a corn-sack, pack in the plants for distribution throughout the field. Sometimes a temporarily-erected overhead wire can be used to assist in this work, while, better still, an improvised pack-saddle and a quiet horse may be brought into service. To make such a saddle, take two corn-sacks, cut them open lengthwise, lap two separate ends over 6 or 7 inches, and sew them strongly together with hemp. Then fold the other ends back on to the main part of the sack so as to make two open pockets when sewn. Put an ordinary riding saddle on the horse, and throw the bag carrier over the saddle. Fill the carrier with plants, and then lead the horse between the rows, unloading the plants from both near and off sides into the adjacent holes. About 1½ cwt. of plants can be distributed each load in this way. Where the land is too steep for a horse to stand (actually where it is almost precipitous), man power is the only means of distributing the planting material.

A mattock is then brought into use for planting. A small amount of surface soil is broken into the hole from the top bank. The plant is placed in the centre of the hole in an upright position, and sufficient soil is dug from the top and side banks to surround the plant with soil to a depth of about 4 inches. This soil should be tramped down firmly; another thin layer of loose soil spread over this surface will complete the job. Looking down on to the plant, it will be seen as set in a shallow basin in which the soil has been well worked. The high mound on the lower side will prevent erosion and offer better conditions for the young plant's roots on the downhill side.

[TO BE CONTINUED.]

Citrus Budwood Selection in Queensland.

H. BARNES, Director of Fruit Culture; and R. L. PREST, Instructor in Fruit Culture.

STANDARDISATION of varieties is a fundamental principle in commercial citrus-growing. In older established orchards, which were planted before any special attention was given to budwood selection, growers are well aware of the existence of trees producing poor crops of fruit of all shapes and of indifferent quality. In most cases, these old trees can be reworked with selected buds to make them produce good fruit. The method is not difficult, and to those orchardists who are not certain how to proceed the Department will willingly make available the services of an instructor to demonstrate in the orchard how the work is done.

Plate 50.
Type of tree now being propagated under the Departmental budwood scheme.

Growers who have planted during the past two or three years, and those intending to plant, are not confronted with the same difficulties of standardising their varieties as were the older growers, because the best varieties have now been classified as "A" grade and the poorer varieties as "B" grade. "A" grade varieties comprise—

Oranges—
- Washington Navel.
- Valencia Late.
- Joppa.
- White Siletta.

Mandarins—
- Beauty of Glen Retreat.
- Emperor.
- Scarlet.

Lemons—
- Lisbon.
- Villa Franca.

Grapefruit—
- Marsh Seedless.

All other varieties are classed as "B" grade.

Plate 51.

Desirable types of trees propagated under the budwood scheme—twelve months planted.

It is further provided by regulation that no trees of "A" grade varieties shall be sold in Queensland unless they have been worked with buds selected by the Department of Agriculture and Stock. In order to ensure that buds of these varieties would be selected from only the very best trees, the Department, some years ago, undertook a wide survey of the orchards in Queensland, and noted those trees of outstanding merit in respect of health, vigour, size of crops, evenness of fruit, and quality of fruit. From the best of these trees budwood is now selected. Purchasers of citrus trees may, therefore, rest assured that trees of the varieties named purchased from local nurserymen possess reliable characteristics, and when grown under suitable conditions will yield a good standardised product.

To illustrate the extent to which the work of selection by the Department is appreciated by nurserymen and growers, in 1934 the number of buds selected and distributed by the Department was 51,625, in 1935 62,545, in 1936 71,416, and in 1937 the number increased to 83,650. These figures are exclusive of about 16,000 buds supplied outside the State. The demand from Queensland nurserymen is growing so fast each year, however, that now it is only possible to supply our own

requirements. The figures undoubtedly indicate an upward trend in the citrus industry, which, in face of adverse seasonal conditions, is gratifying. There is no doubt that one of the main factors in this improvement in the industry is the high standard of citrus trees now obtainable through the operation of the departmental budwood scheme.

Plate 52.
A tree in the Valencia Late Budwood Plot.

The new plantings are being made on sound commercial lines under the direction of departmental officers. The following figures showing the number of buds of the main varieties distributed in the course of 1937 are interesting, and serve as a measure of the popularity of each variety:—

	Buds.
Valencia Late	14,700
Washington Navel	13,000
Joppa	12,850
Glen Retreat	9,950
Emperor	7,850
Villa Franca	7,300
Lisbon	5,450
Marsh Seedless	4,775

In addition to selecting budwood, the Department also selects each year sufficient seedling orange and bush lemon seed to meet nurserymen's requirements for raising seedlings. For the 1937 season, 45 lb. of lemon seed and 53 lb. of orange seed were distributed. While it is recognised that final selection of seedlings from the seed-bed is the most reliable means of securing vigorous stocks on which to work, nevertheless stronger seedlings are produced from seed selected from vigorous, healthy seedling trees than from seed obtained haphazardly from any convenient source.

Plate 53.
A tree in the Scarlet Mandarin Budwood Plot.

In order to ensure continuity of supply of reliable budwood, the Department, some years ago, established a small orchard in the Gayndah district with trees worked with buds obtained from the best known trees. The plot has made excellent growth, and in a few more years will supply most of the budwood requirements for Queensland citrus nurserymen. Most of the trees are producing fruit of good quality and appearance, and analyses are being made annually of the fruits for comparative

purposes. For example, last season's fruit from three-year-old Washington Navel trees were analysed, with the following result:—

Rind	25·0 per cent.
Rag	8·6 per cent.
Juice	47·5 per cent.
Brix	8·44 to 9·29
Acidity	0·95 per cent. to 1·07 per cent. citric acid
N/10 Soda Test	14·9 to 16·7

Plate 54.
A Marsh Seedless tree in the Budwood Plot.

This is an exceptionally good result, which will improve very considerably as the trees grow older.

TO CALCULATE CONTENTS OF A CIRCULAR TANK.

A simple formula for finding out the contents of a circular tank, or, in fact, any cylinder:—

The number of gallons in water in 30 feet length of any cylinder equals the square of the diameter in inches. Thus a tank 100 inches in diameter would contain 100^2, or 10,000 gallons of water in a depth of 30 feet; therefore, for a depth of 6 feet the contents would be 2000 gallons.—"The Pastoral Review."

Main Road Construction in Queensland.

In Queensland, last financial year, 383·63 miles of new roadway—more than a mile a day—were completed and opened for traffic by the Main Roads Commission. In addition, 134·95 miles of previously improved roadway were converted to a higher type to meet the demands of increased traffic; making a total of 518·58 miles. At the close of the year 495·31 miles of new road works and 86·96 miles of stage construction were in progress, representing works approximately one-third completed. The total length of works constructed to 30th June amounted to 4,011·61 miles, including the sections remodelled for increased traffic.

Bridges of all types to an aggregate length of 6,986 feet were completed during the year and an additional 4,063 feet were under construction when the year closed. The total length of bridges completed from inception of operations to 30th June, 1937, was 12·69 miles.

Plate 55.
Protective work at Narrowneck, on the Pacific Highway, near Southport.

In addition to this progressive works programme, all previously constructed sections were kept up to standard with maintenance expenditure. Further than this, unconstructed sections, where permanent works treatment was not possible, received maintenance attention to assist traffic in the meantime. In all, 12,994 miles of road were maintained. This programme resulted in continuous employment for an average of more than 3,000 employees.

The foregoing facts have been taken from the Sixteenth Annual Report of the Commissioner of Main Roads, Mr. J. R. Kemp.

Plate 56.
A Bend in the Barney View Road, looking towards Palen Creek, near Beaudesert.

Plate 57.
Where the Barney View Road joins the New England Highway.

Plate 58.
New Bridge over Tenthill Creek, on the Brisbane-Toowoomba Road.

Plate 59.
ALONG THE LOCKYER-DARLING DOWNS HIGHWAY.—"A" class bridge, with 8-30 feet timber spans, 1-90 feet timber and steel truss span, 20 feet between kerbs, 53 feet maximum above stream bed, constructed by the Main Roads Commission.

Following are further excerpts from Mr. Kemp's report, which are of particular interest to farmers and everyone else concerned with rural development and the general progress of the State. Through the courtesy of the Commission, we also are able to reproduce a series of excellent illustrations from the report, and which give some indication of the immense importance of a great national service.

CONSTRUCTION AND MAINTENANCE.*

Road construction and maintenance are in a constant state of evolution. This is due to the revolution in transport methods which has taken place largely within the life of the Commission. The old high-crowned macadam road has given way to flat-profiled smooth surfaced pavements suitable for fast moving rubber-tyred vehicles which (with the exception of those shod with solid rubber tyres), whilst not imposing such destructive vertical impacts upon road pavement foundations, do impose severe shearing forces to road surfaces. These forces become very destructive at comparatively low traffic densities, and in Queensland the economics of maintenance are such as to require the treatment of surfaces with bitumen, bitumen-tar compounds, concrete, &c., when the traffic density exceeds 100 vehicles per day per traffic lane. Even below this density it would frequently be economical to surface-treat the pavement.

For the lower type roads it is very important that proper selection of materials be made to avoid heavy recurring maintenance costs due to pot-holing and corrugation. For this reason, unsurfaced water-bound macadam is now seldom used in new construction, unless it be intended to surface with tar or bitumen in the near future. In its stead the Commission uses sound hill gravels which usually contain good binder, river gravels which require binding with loam, C class metals, and B or A class metals of harder quality, crushed down so as to make artificial gravels.

River and creek gravels wear well if screened to small size, provided they are well bound with suitable loam (slightly clayey), properly incorporated. This type is named by the Commission as Class E, and some objections have been raised by road users when they learn that an E class road has been selected for their needs in place of C or D. Their fears are groundless, for the selection does not imply a lower type than C or D, but indicates that it is more economical to construct and maintain this type in that particular instance.

The Commission has evolved a simple procedure for testing loams to be used either as binders or for the construction of loam roads where other materials are not available, and one of the tests employed is under consideration by the Australian road authorities as an Australian standard.

The importance of laboratory tests is very great, and the Australian road authorities to-day hold regular conferences of their technical officers in order to arrive at uniform methods and to give each other the benefit of their experience.

Instances can be quoted where the result of tests has indicated that it was more economical to use binders on a haul of several miles than to use the local material. The indications are generally confirmed

* From the Sixteenth Annual Report of the Commissioner of Main Roads for the year ended 30th June, 1937.

Plate 60.
The Road through the Forest to Tin Can Bay.

Plate 61.
The Mary River Road at Fleiter's Hill.

Plate 62.
Mile Posts for Mary River Road ready for distribution.

Plate 63.
Kilkivan-Boonara Road-Wide Bay Creek. Multiple concrete culvert. The old crossing is shown on right,

in practice. It is now generally demanded that roads constructed with C class materials shall have the top course of selected harder material fine-crushed, thus enabling its future maintenance to be undertaken with graders at low cost. This material when free from clay is frequently used, even on roads of high traffic density, in which case it is surfaced with tar and bitumen compounds.

Fine crushed rock is now one of our most valuable surfacing materials for lower type roads. It consists of the run of the crusher from B or A class metals, the harder the metal the smaller the size required, the object all the time being to produce an artificial gravel easy to maintain. In order to produce hard and smooth pavements, traffic consolidation and grading are employed as much as possible on this type of material.

Partially decomposed rhyolites, trachytes, and andesites, amongst other rocks, lend themselves to this treatment, and a fine example is to be seen on the upper portion of the Nerang-Beechmont road in the shires of Nerang and Tambourine.

The importance of cataloguing, classifying, and describing rocks of various classes—each class being economically suitable for certain traffic in certain localities—has long been recognised, and many years ago the University of Queensland did valuable work in this respect. To-day, our requirements are very different in respect of road-building materials from those of even a few years ago.

HEAT TREATMENT.

The two heat treatment plants have continued in almost uninterrupted use in the Cunnamulla, Dirranbandi, and Bollon districts in areas where no other suitable road-making material is available at reasonable cost. The economic use of these machines at present is governed by suitability of the soil and by the cost of other material. This method will only be employed where possible, if the cost of loam or better class road-making material is not less than one and a-half to twice that of the burned material. The sections at Dirranbandi on the Culgoa River flats have been subjected to flood conditions since construction and, although water remained on them for a week, very little damage, even from scour, resulted. The plastic properties of the clays have been completely destroyed in the process of heat treatment. The machine under suitable conditions has effectively burned the soil to a depth of from 2½ to 3 inches at a lineal speed of up to 55 feet per hour (6 feet width).

ROAD SAFETY.

The construction of motor vehicles is not, as far as is known, controlled anywhere in the world by road construction authorities. The capability of vehicles for speed has increased rapidly, due to engine, springing, tyre, braking, and other improvements. Speed upon the open road has increased proportionately, and this increase in average speed, combined with greater traffic density has necessitated increased pavement widths, smoother non-skid surfaces, increased visibility on both horizontal and vertical curves, and greater super-elevation or banking on curves than formerly.

By the expenditure of sufficient money on remodelling and improving roads, it would be possible, within certain limits, to make the roads as safe as they were formerly for the then fewer vehicles travelling

at slower average speeds, but other factors enter into the matter. The increasing number of drivers apparently is adding to the number of irresponsible ones; let us hope not in a higher ratio to safe ones than formerly. At any rate, the number of accidents has increased since the introduction of the motor vehicle, and to such an extent as to warrant drastic action towards control of driving.

The adaptability of the human mind and frame to deal with the driving difficulties associated with increases in speed has finite limits, and it is certain that we will never see an adaptability to speed by the average motorist equal to that of the professional racing track motorist; and so we are faced with the question of how to control traffic for safety upon our roads in a manner consistent with their condition, the density of traffic, and the types of vehicles employed.

The Royal Commission on Transport agreed with the submitted statement of the Commissioner of Police that regulations fixing speeds are necessary. The facts set out below are enough to show this necessity; for the motor vehicle in the hands of a reckless or inexperienced driver is a dangerous projectile, and the heavier the vehicle the more the danger.

The "Main Roads" Journal, Vol. 8, No. 4, published by the Department of Main Roads, New South Wales, contains an illuminating article on the subject of "Speed versus Safety," which gives extracts from articles by R. A. Moyer, Associate Professor, Highway Engineering, of the Iowa State College, U.S.A., in the journal, "Civil Engineering," December, 1936, and February, 1937, issues.

It is there indicated that a slow-thinking driver at 40 miles per hour will travel 59 feet after seeing danger before he can apply brakes. If his brakes are good, he can stop in another 66½ feet, or a total of 125½ feet; but on the average in 107 feet, or a total of 166 feet after seeing danger.

Similarly, at 60 miles per hour, the figures are—

88 feet, plus 150 feet, or 238 feet, with good brakes; and

88 feet, plus 241 feet, or 329 feet, with average brakes;

whilst at 80 miles per hour they are—

117 feet, plus 267½ feet, or 384½ feet, with good brakes; and

117 feet, plus 428 feet, or 545 feet, with average brakes.

The results may be imagined when brakes are faulty or the road slippery and where sharp curves exist, or where road profiles are not perfect.

The same article states that if the brakes on one side exert a force 40 per cent. greater than on the other, the car may suddenly swerve over into the lane of oncoming traffic in an emergency stop at high speeds. Tests on 2,134 cars indicated that 31 per cent. of them had 40 per cent. more braking effort on one side than the other. If cars here are in similar condition—and there is no reason to suppose they are not—it is evident for this reason alone that high speeds are dangerous on our roads, which have not, for financial reasons, been built to the high-speed standards of more important American and English highways.

High speeds, it is quite evident then, demand greater road widths for given traffic density.

Plate 64.

Heat treatment work proceeding under drought conditions. Preliminary consolidation of the black soil formation is effected by filling bays with bore water.

Plate 65.

Heat treated black soil. The white strip is the third traverse of the machine, and it will be graded over on to the adjacent lower course strip.

When vehicles are approaching each other, or where the view is restricted to less than 660 feet special care is necessary.

Overtaking of vehicles under any circumstances on roads under 20 feet width should not be permitted where any visible vehicle is approaching in the opposite direction within a distance of 660 feet from the vehicle to be overtaken.

Overtaking on either horizontal or vertical curves where the visibility is less than 660 feet should be prohibited.

Overtaking of vehicles should be prohibited on bridges less than 30 feet wide, and less than 500 feet long.

When a road is crowded it is thus obvious that maximum traffic capacity does not depend on high speed, and those selfish motorists who break out of line and pass strings of vehicles under such circumstances become a menace to no purpose.

Australian standard railway crossing signs are being erected on all important roads. The Main Roads Commission, in addition, is erecting visibility discs on curves, particularly for the guidance of night traffic. The disc exhibits a plain white surface on the left or near side, while those on the right-hand or off-side are white with a horizontal black bar 3 inches wide across the centre. They are placed on the outside only of curves. Culvert posts serve as a guide to traffic, being marked in such a way as to correspond with the visibility discs.

It, therefore, behoves the travelling public to obey such rules as indicated and avoid the loss of life and injury to persons, not to mention the severe monetary losses incurred in the damage to vehicles.

AN EASY WAY OF PULLING OUT POSTS.

This method is unbeatable where a line of posts has to be pulled out. Drive the tractor alongside, put a chain round the bottom of the post and make fast to a

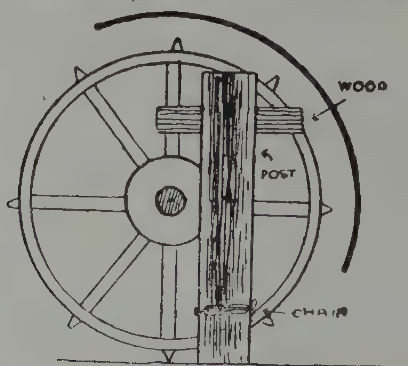


Plate 66.

gripper on the back of the wheel. Put a piece of timber between the top of the post and the wheel to act as a fender, then move forward in low gear and out it comes.

Sheep on the Farm.

JAS. CAREW, Senior Instructor in Sheep and Wool.

SHEEP should have a permanent place on any farm on which conditions are suitable. One of the advantages of sheep is that they provide two distinct sources of income annually—wool and mutton—besides their natural increase.

In Queensland, merino sheep constitutes about 97 per cent. of our total number. This breed is especially adapted to conditions in the central and western districts of the State, but when forced to breed and develop in an unsuitable environment constitutional weakness is a real risk.

British breeds have been developed and maintained in an environment which has influenced their adaptability to Queensland conditions. In mixed farming districts these breeds—especially the pure-bred rams—can be used with advantage. The Corriedale originated in New Zealand, and their improvement has been progressive both there and in Australia. In Queensland the Corriedale is regarded as a dual-purpose sheep, coming between the merino and pure British breeds, overlapping both in adaptability to a considerable degree.

In sheep-breeding, local conditions should decide the system of production.

Sheep-breeding under diversified farming conditions where the British breeds are used is totally different from merino-breeding in the West. The merino is bred under purely pastoral conditions, and the progeny is retained for wool and mutton production. With the imported mutton breeds the aim of the farmer is to dispose of the progeny at the earliest marketable age. To do this successfully there are two major points to be observed:—

(1) The use of pure-bred rams of quick-maturing qualities suitable to location and conditions.

(2) Suitable pasture or cultivated crops should be available for ewes as soon as their lambs are dropped, and for topping off the lambs.

Other considerations of importance are the suitability of the ewe flock for wool production as well as for breeding; economy in pasturing the ewe flock from the time the lambs are taken off until the next drop of lambs; the general health of the flock and freedom from parasites; fodder provision for carrying the flock successfully through periods of scarcity; and culling the breeding flock for age while they are still capable of being fattened and sold at a profit. To start successfully in breeding, whether for wool, mutton, or for fat lambs, healthy sheep are essential. This may mean paying more for young sheep, but it will generally prove the best and safest policy.

SHEEP ON COASTAL COUNTRY.

Coastal farmers who are desirous of stocking sheep usually ask the question how to start to the best advantage. Conditions and circumstances along the coast vary so greatly that no hard and fast rules can be laid down.

It is usually considered that where dairying, pig raising, and mixed farming can be successfully combined in coastal areas the conditions are favourable for fat lamb raising. There is one chief guiding point, and that is, where the rainfall can be considered as excessive for the combination mentioned, it will be decidedly against the wellbeing of sheep.

For fat lamb raising the British breeds should be used. The most suitable of them is the Romney Marsh, and the wetter the conditions the nearer to the pure Romney Marsh the breeding flock should be. If crossbred or Corriedale ewes are not available, then strong-woolled, plain-bodied merino ewes should be introduced, to which should be mated pure Romney Marsh rams. Of the progeny, ewes should be retained for breeding and the wethers used for home consumption or sold as fat lambs. Merino ewes should not be retained on the coast for longer than two seasons. Now is about the best time to buy them, and, if joined immediately and allowed six weeks with the rams, lambing should be completed by the beginning of August. All lambs should be marked during August, and the ewes shorn in September. If the ewes are healthy and well fed from the time the lambs are dropped, all lambs that are to be sold should be fit before or during December. A month after the lambs are disposed of, the ewes that are to be sold should be fat and sold as such to secure best results. Healthy merino ewes with good teeth and carrying not more than four or five months' wool should fatten on good feed in three or four weeks.

—*Jas. Carew.*

[*Photo.: Department of Agriculture and Stock.*

Plate 67.

Ewes and Lambs, Glengallon, Warwick District.

SHEEP NASAL FLY.

During the spring and summer months, graziers in many parts of the State may be puzzled for an explanation as to why their sheep, for no apparent reason, suddenly gallop round the paddock, or stand in bunches with their faces buried in each other's wool, or held very closely to the ground. If such a group is watched closely, the attitude of the animals will be seen to be due to the presence of a stout, greyish fly, which frequently is to be seen during this time of the year resting on the fly screens and water tanks around the homestead. This is the sheep nasal fly, which lays its maggots on the edges of the nostrils of the sheep. The action of the animals in burying their noses in the wool of other sheep, or in the soil, in an endeavour to protect them from the flies, is readily understandable.

The maggots, after they have been laid by the female fly, crawl up the sheep's nostrils and into the communicating cavities. Here they remain for several months. Being provided with a pair of stout hooks in the region of the mouth, they attach themselves to the lining of the nostrils and cause the secretion of much pus-charged mucous, on which they feed. The condition in sheep known as "snotty nose" is due to the presence of these maggots, which may also be responsible for such a severe irritation that the infested animal loses condition.

Control of the sheep nasal fly is not very effective at present, but much good can be done by daubing the animals' noses at frequent intervals with Stockholm tar. This procedure should be especially carried out between October and January, inclusive, when the flies are most numerous.

—*Dr. F. H. S. Roberts.*

SHEEP IN AUSTRALIA.

The sheep population of the Commonwealth at the end of September, 1937, was—

Queensland	20,011,749
New South Wales	51,936,000
Federal Capital	228,317
Victoria	17,663,103
South Australia	7,905,112
Western Australia	9,024,758
Tasmania	2,149,900
Northern Territory	25,483
Australian Total	108,944,422

For comparison, the figures for some other countries in the Southern Hemisphere are given below—

Argentine	44,000,000
South Africa	35,843,744
New Zealand	31,210,734

A study of the figures reveals some interesting and little-known facts. For instance, few people realise that Western Australia has surpassed South Australia in sheep numbers.

In view of reiterated statements of South African competition, it is of interest to know that New South Wales has 16,092,256 more sheep than that country. Few people realise that Argentine has nearly 9,000,000 more sheep than South Africa.

PROSPECTS FOR FAT LAMB RAISING IN QUEENSLAND.

The prospects for fat lamb raising in Queensland are becoming more assured as time goes on. The last two years on the Darling Downs and the coastal areas have not been favourable either for pastures or for the raising of crops. Notwithstanding this fact, steady progress has been maintained, and the lambs coming forward showed a percentage to be the right age and correct formation, with plenty of quality and possessing export bloom.

Other lambs which came forward were showing age, the effect of dry conditions, and the scarcity of suitable food. This is, as was to be expected, in keeping with the conditions prevailing; but, what is most important is that mostly all the lambs showed suitable breeding, and, if such results can be obtained under adverse circumstances, it is easy to realise what might be expected under favourable conditions.

The introduction of such a number of pure breeds under the Fat Lamb Scheme has had a most desirable effect, and it would appear that the confidence of those in the industry now is taking definite form. One big disadvantage is the lack of suitable ewes, and this is becoming more definite as other phases of the industry become more manifest. Until we have the great proportion of our breeders of an even type and suitable for the purpose, irregularity in the form of carcase in lambs can be expected. The ideal breeder for the purpose is the large-framed, roomy ewe productive in wool and milk that will give a high percentage in lambs and mate at a season suitable for lambs to develop and top off for sale. Under present circumstances the best must be done with those that are available.

GATE HOLDER.

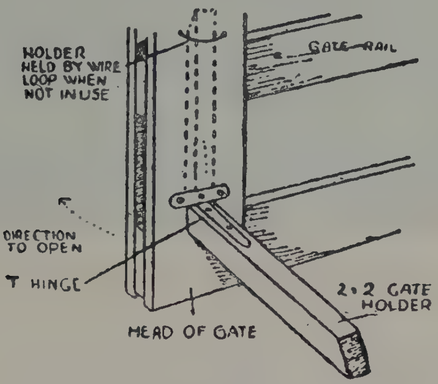


Plate 68.

A simple attachment, which will automatically hold a gate open in any position, can be made from a small T hinge and a piece of 2 x 2 timber about 18 inches long. The diagram explains the method of construction.

TO ANCHOR A STRAINING POST.

When it is necessary to put a strainer post on a face where it is too steep for a stay to be effective, or where for other reason it is unsatisfactory to use a wooden stay, the following method will be found satisfactory:—

Dig a trench, in line with the fence and at right angles to it, about four feet back from the post. Then dig another similar trench four feet further back big enough to hold a solid block. Put several strands of No. 8 wire from the base of the

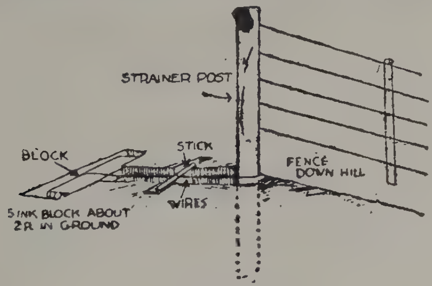


Plate 69.

strainer post, just under ground level, along a shallow trench and round the block which is to act as anchor. Now insert a stout twitch stick between the wires in the trench halfway between post and block and twitch or twist up until tight. Then fill in all the trenches and ram tight. This anchor will never let the strainer post lift or lean on any country.—*Weekly News* (Auckland, N.Z.)

Acute Bloating in Ruminants.

W. DIXON, Inspector of Stock.

ACUTE bloating of ruminants, cattle particularly, may occur at any time from a variety of causes, but most commonly through turning hungry cattle on to luxuriant green feed, or on to herbage country, after heavy rains and when the young herbage is making rapid growth.

Under station conditions, where stock are not seen every day, little can be done to prevent losses, but on smaller holdings losses may be minimised if a stack of dry hay is provided and to which stock have access before and after being allowed on to green feed. The long, dry hay assists regurgitation, which is difficult when large quantities of short, succulent feed has been eaten, and, if it is available, animals will always take a few mouthfuls, with beneficial results.

Symptoms of bloating appear quickly. Animals stop feeding and stand still with arched backs, turning their heads frequently to the abdomen, which increases rapidly in size—the swelling becoming most marked on the left side. As the abdomen enlarges, breathing becomes more and more difficult. In very acute cases the nostrils dilate, the animal stretches out its tongue, bellows, and finally staggers and dies in convulsions.

In less acute cases the development of gas is slower, and frequent belching and vomiting prevents its excessive accumulation. In these cases the use of a gag made from a stick about 8 inches long and 2 inches in diameter, with holes at each end through which a thin rope is run to form a rough bridle—the stick being smeared with tar or grease before being put into the mouth—is of value, as it facilitates belching.

Massage of both flanks, applying moderate pressure with both fists upwards and downwards—particularly over the whole of the left flank—while the animal stands with its head uphill, is also beneficial.

Puncture of the rumen with a trocar and canula saves many valuable animals. The instrument must be sterilised by boiling for ten minutes before use. It is wise to keep it ready, wrapped in a sterile towel. The trocar, with its protecting tube, is pushed into the most prominent point of the left flank, usually midway between the point of the hip and the middle of the last rib. Holding the instrument in the left hand, a sharp blow with the palm of the right hand causes it to penetrate the skin, abdominal wall, and the rumen.

The point of the trocar is directed towards the right elbow.

The trocar is withdrawn gradually from its sheath, allowing the gas to escape slowly, giving immediate relief to the animal.

When gas ceases to escape, a cork may be used to close the canula, which is left in position and secured by a clean bandage tied over it and round the body of the animal. Any further accumulation of gas is allowed to escape slowly by removing the cork. When no longer required the canula is withdrawn, and the small puncture dressed with tincture of iodine.

SOME FACTORS IN PROFITABLE DAIRY PRACTICE.

The first essential is to have every cow in the herd tested to make certain that she is worth keeping. As the animals must be adequately and properly fed, the next important factor is that governing production.

A good water supply is necessary. An ideal condition is, of course, sufficient water at convenient points in every paddock. Many dairy farmers, however, are satisfied with at least one good watering place. That means that if the herd is feeding at a distance from the water the cows do not go to the trough to drink as frequently as they would if it were closer to their grazing ground. On hot days it takes quite a lot out of animals to walk any distance, and when they do come into water they stay in its vicinity. As the area surrounding the water is usually bare from over-grazing, they get very little to eat. So, in either case, the milk flow is seriously affected.

Another point which is often overlooked is the destruction of grass and herbage caused by the extra tramping of the animals going to and fro. Cows frequently destroy more feed with their feet than they actually eat.

Subdivision of paddocks will provide succulent pastures carrying a full complement of proteins, which the cattle relish and clean up as they proceed without tramping half of it into the ground. With pastures under complete control, the herbage and grasses can be fed off as required; and, in times of plenty, all surplus growths may be mown and conserved either as hay or ensilage.

—*G. H. E. Heers.*

CALVING TABLE.

AVERAGE PERIOD OF GESTATION, 285 DAYS.

If served on—	Will calve about—	If served on—	Will calve about—
1 January	13 October	1 July	12 April
7 January	19 October	7 July	18 April
14 January	26 October	14 July	25 April
21 January	2 November	21 July	2 May
28 January	9 November	28 July	9 May
31 January	12 November	31 July	12 May
1 February	13 November	1 August	13 May
7 February	19 November	7 August	19 May
14 February	26 November	14 August	28 May
21 February	3 December	21 August	2 June
28 February	10 December	28 August	9 June
1 March	11 December	31 August	12 June
7 March	17 December	1 September	13 June
14 March	24 December	7 September	19 June
21 March	31 December	14 September	26 June
28 March	7 January	21 September	2 July
31 March	10 January	28 September	9 July
1 April	11 January	30 September	12 July
7 April	17 January	1 October	13 July
14 April	24 January	7 October	19 July
21 April	31 January	14 October	26 July
28 April	7 February	21 October	2 August
30 April	9 February	28 October	9 August
1 May	10 February	31 October	12 August
7 May	16 February	1 November	13 August
14 May	23 February	7 November	19 August
21 May	2 March	14 November	26 August
28 May	9 March	21 November	2 September
31 May	12 March	28 November	9 September
1 June	13 March	30 November	11 September
7 June	19 March	1 December	12 September
14 June	26 March	7 December	18 September
21 June	2 April	14 December	25 September
28 June	9 April	21 December	2 October
30 June	11 April	28 December	9 October

COMFORT IN THE COW YARD IN WET WEATHER.

On many farms the cow yard becomes very boggy in the wet season, and conditions are then anything but pleasant for the milker, as well as the cow. The dairyman has to walk through mud and slush, sometimes up to or over his ankles, and the cows often drag their udders through the mud when walking into the bail from the yard. Consequently, the mud adheres to legs, udder, and belly, entailing a considerable amount of work in washing both teats and udder. If this cleansing job is not done correctly and thoroughly cream of inferior quality may be delivered at the butter factory, for which only second-grade price can be paid.

To ensure comfort in the cow yard in wet weather, a small enclosure, 36 feet long and 36 feet wide, may be constructed. This small yard should be concreted. Sand and stone can be obtained quite handy to the farm as a rule, so the work can be done by the farmer at the cost of the cement. Dairy farmers who have adopted this idea declare that they wonder why they had not built such a draining yard before. It makes all the difference in the comfort of both man and beast in wet weather milking. A yard of the dimensions given will hold twenty cows quite comfortably.

WHAT IS PROFITABLE DAIRYING?

Some farmers consider that the more cows they milk, the more efficient and profitable their dairying practice becomes. But when success in dairying is mentioned, many other factors must come into the reckoning.

Pasture management, milk and cream quality, and stock diseases can all be controlled by the farmer.

Good pasture management requires the introduction of the best grasses, rotational grazing, the conservation of fodder, pasture renovation, and the use of any necessary fertilizers.

The quality of milk and cream is controlled largely by the attention given to milking, separating, storage on the farm, freedom of the pastures from milk-tainting weeds, and the health of the herd.

The incidence of disease in the dairy herd, of course, depends largely on the care and attention given to the animals.

The milking capacity of the herd depends obviously on the milking capacity of the individual cows. The question as to which are the best producers can be determined by systematic herd testing. Unprofitable cows should be culled as soon as practicable. Only the best cows should be kept as breeders. Boiled down, the yield of butter-fat to the acre determines the soundness of dairy farm management.

Good farm management and a poor herd are just as bad as a good herd and poor management. Good management and a good herd together must result in a high yield per acre.

KNOTS TO KNOW.

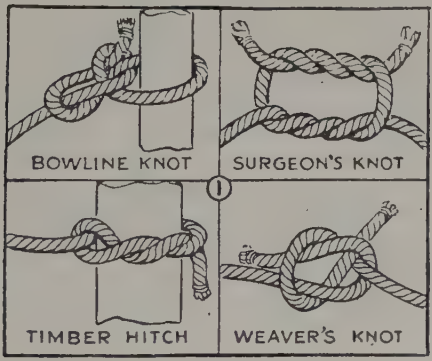


Plate 70.

The bowline knot is especially useful in making simple rope halters, as it is easy to tie and will not slip. Put the rope around the animal's neck, form a loop, run the short end of the rope through it, then around the long end and back through the loop. To tie the timber hitch, make a half hitch and give the loose end an extra twist, as shown. This is used on jobs such as hauling posts or pipes. For tying sacks and heavy packages there's nothing better than the surgeon's knot. The only difference between this knot and a square knot is the extra twists in the rope, but it stays much better. The weaver's knot should be kept in mind for rope-splicing jobs.

Market for Pig Meats in the United Kingdom.

THE Australian Meat Board, at a recent meeting, gave attention to the question of the United Kingdom market for pig meats and the best way to export pig meats from Australia to meet the needs of that market. In this connection the Board had before it a report by Mr. R. G. Watson, chairman of the Australian Pig Industry Council, and representative of the pig producers on the Australian Meat Board. Mr. Watson's conclusions, arrived at after personal investigation in the course of a visit to the United Kingdom, were confirmed in a communication received from the Board's executive officer in London (Mr. H. R. Heywood), and they were strongly supported by Mr. A. C. Fisken, the chairman of the Board, who had recently returned to Australia from abroad. The decision of the Board in relation to the matter was embodied in a resolution passed at the meeting, and which it was decided to publish as a recommendation to pig producers in the Commonwealth. The resolution reads—"The Board considers that the best way to export pig meats from Australia to the United Kingdom is in the form of frozen baconer carcases and pieces suitable for manufacture into bacon and hams, and recommends accordingly to producers." In recommending the baconer trade of the United Kingdom as the best avenue for the development of the Australian pig export industry, the Board was influenced by the report that the British producers are capable of producing the great bulk of the pork requirements of the United Kingdom.

Thus, it is considered, that future restrictions, if any, on Empire pig meats are more likely to be placed on porkers than on baconers, the latter being in short supply as evidenced by the inability of United Kingdom curing factories to operate at more than 50 per cent. capacity.

The expansion of Australian exports of baconers would therefore assist the bacon curing industry in the United Kingdom and have the further merit of not competing so directly, or to the same extent, against the Home producer as would an increase in the export of porkers.

The considerable increase in the volume of exports of pig meats from New Zealand and Australia to the United Kingdom which has taken place in recent years has been due, mainly, to the increase in shipments of baconers.

—*H. S. Hunter.*

MORTALITY IN YOUNG PIGS.

In a series of observations carried out in England by Mr. A. W. Menzies Kitchin, and in which the objective was the collation of data relating to pre- and post-weaning mortality in young pigs, complete records of cause of death were obtained in twenty-four herds covering 1,741 observations. The results are analysed in the following table:—

Cause of Death (Pre-weaning).	Per cent.
Overlaid by sow	52.0
Pneumonia, colds, &c.	10.1
Savaged by sow	2.5
Insufficient milk	2.6
Accident	2.8
Bad doers	10.4
Erysipelas	0.2
Scour	5.0
Not known	2.3
Not recorded	9.0
Other causes (rupture, castration, physical defects, &c.)	3.1
	100.0

During the same year, post-weaning mortality (death after weaning) represented 3.15 per cent. of the number of pigs, and showed a herd range of from nothing to 11.30 per cent. The analysis of the causes of death of 314 pigs drawn from twenty-three herds is given below:—

Cause of Death (Post-weaning).	Per cent.
Scour and gastritis	10.5
Accident	1.3
Cad pigs	25.5
Erysipelas	10.8
Worms	1.9
Pneumonia and colds	12.1
Tuberculosis	3.5
Sugar beet top poisoning	9.9
Not known	13.6
Not recorded	2.9
Inflammation	1.9
Other causes	6.1
	100.0

"Cad pigs" were pigs which for some unknown reason failed to grow, lost weight, and finally died or were destroyed. Undiagnosed worms, pneumonia, tuberculosis, and bacterial infection are probable causes of loss. To these may be added insufficient trough space which resulted in the crowding out and ultimate starvation of the weaker pigs, the feeding of ill-balanced or unsuitable rations, and a lowering of resistance to infection due to unsuitable housing, and particularly to damp and draughts. Poisoning by sugar beet tops occurred on one farm. At one feed the tops were accidentally fed green in excessive quantities, and as a result thirty-one pigs died during the ensuing week.

—*E. J. Shelton.*

PIGGERY PESTS.

At this season of the year pigs are frequently tormented by house flies, mosquitoes, and lice. This irritation can be allayed to a large extent by giving the pigs a daily dressing (only a very small quantity at each application) of oil to which a small quantity of distinfectant has been added.

The pig has a tough skin and often carries a coarse coat of hair, but despite that his health may suffer through parasitic infestation. Where the skin is lacerated or badly sunburnt and cracked, blowflies and house flies swarm around, becoming a source of risk to the animal's general health. Wounds resultant from castration and other operations are favourable places for attack by blowflies. Where there is considerable inflammation, painting the affected areas with a dilute solution of iodine will be helpful. Carbolised glycerine—or boro-glycerine—is an excellent dressing once the wounds have been thoroughly cleansed by washing and/or syringing out. Any treatment for reduction of irritation and inflammation and assistance in healing will be beneficial.

Prevention of attack is often difficult, but something might be attempted along these lines by eradicating breeding grounds like manure heaps where flies breed freely. Swampy areas encourage mosquitoes and sandflies, and neglected sties and pens and rubbish lying about harbour fleas and lice. A general clean-up along the lines of a spring cleaning is well worth while.

—*E. J. Shelton.*

TESTING AND RECORDING LITTERS.

In a total of 435 litters examined in New Zealand and reported on by Mr. C. P. McMeekan, the average number of pigs born per litter was 9.6, born alive 8.8, and weaned 7.9. The average litter weight in lb. at twenty-one days was 100, or 12.7 per pig, at fifty-six days 295, or 37.5 per pig. There was little variation in the yearly averages. Average weights per pig varied from 6 to 21 lb. at twenty-one days, and from 15 to 56 lb. at fifty-six days.

The results show that a standard of 300 lb. per litter at eight weeks can reasonably be expected, but only 50 per cent. of the sows tested attained this production. The best and worst herds showed litter weights of 330 lb. and 200 lb. at fifty-six days. The worst herd had more pigs born per litter, but a mortality rate of 27 per cent.

The number of pigs weaned is more important than a heavy (weaning) weight per pigling, although both are necessary. The individual weight of the weaner is not dependent on litter size.

Mortality records show a total mortality of piglings born alive of 11 per cent. Many deaths can be avoided by efficient management. Maiden sows weaned fewer pigs and produced a lower total litter weight than sows with their second to sixth litter. A few data on tenth and eleventh litters indicate that the sow may retain her breeding qualities to this stage.

Season of farrow has little effect on number weaned or litter weight, and farrowings are apparently well spaced throughout the year, although correlated with the seasonal cow-milk supply.

A table showing litter production by purebred Tamworth, Large White, Large Black, and Berkshire, as well as first-cross litters, indicates that the strain within the breed is of far greater importance than the breed itself. The figures do not suggest that the first cross must be used to obtain prolificacy, thriftiness, and rapid growth, nor were there wide differences between the first cross or purebred male x grade female litters. The ability of a sow to transmit high-producing qualities to her progeny is most important.

Poultry Notes.

P. RUMBALL, Poultry Expert.

Size of Eggs.

ALTHOUGH the internal quality of the egg is of primary importance in determining price, the factor of size cannot be overlooked. Eggs are usually graded for sale according to size; but those averaging 24 oz. to the dozen are in greatest demand, not only in Queensland, but in the markets to which our surplus production is consigned.

In these circumstances, every poultry raiser should strive to produce eggs that meet the requirements of the market. To do this, it is necessary to select breeders that will reproduce progeny capable of laying the maximum number of eggs closely approaching 2 oz. in weight. Most poultry keepers when selecting their breeders know very little about the early performance of their stock in respect of size of egg—particularly the size of egg that a hen laid during her first year of production. As a breed is more prolific during the first laying year, it is then that the egg size is of particular importance.

All pullets when commencing to lay produce an egg very much undersized. Some birds take a considerable time before their eggs reach the most desirable commercial size, and others, again, may take only a week or two. As it is an inherited factor, egg size is one of the chief points to be considered in selecting future breeders. Many pullets —the breeding stock of the future—will be coming into production within the next month or so, and it is suggested that poultry breeders who are not entirely satisfied with the size of egg from their flocks should take the opportunity of selecting and marketing pullets that commence to lay eggs of a 2 oz. standard early in life. Many of these birds may have to be rejected for some purpose or other, consequently the number selected should be large enough to allow for a reasonable percentage of rejections.

Milk as a Poultry Food.

Skim milk is an excellent poultry food, and if fowls are given all the skim milk they can drink, and even if fed on nothing else but grain, they will continue to lay well.

Farmers generally appreciate the necessity of efficient feeding, and to give their fowls the necessary amount of protein use one or other of the prepared mashes. These mashes are usually fed with grain, the birds being given an equal quantity of each. In these circumstances, a sufficient amount of protein is made available to the birds.

The farmer who has skim milk to give his birds may, therefore, depart somewhat from his ordinary practice, for skim milk is a protein-rich food; but how far he may do so depends on the quantity of skim milk available. If the birds are given only, say, half the skim milk they will consume, half the quantity of mash that is usually fed should be supplied, and the grain increased by about 50 per cent.

It will generally be found a sound policy when milk, mash, and grain are being fed to the flock, to give the birds all the grain that they will consume, and not force them to eat given quantities of mash. This policy will largely enable the birds to balance their own ration.

Protect Eggs from Mould.

With the humid conditions prevailing at this time of the year, eggs are more prone to decomposition than during winter. This is not because of the effect of the climate on the egg itself, but to the rapidity with which mould growths develop during warm weather. If it were practicable to prevent the egg coming in contact with moulds, decomposition of the egg from this cause would not occur.

If fowl yards are allowed to become littered with straw, dry grass, and similar material, mould spores will develop abundantly. Consequently, the poultry farmer is advised to clear away all rubbish, and do all that he can to prevent the development of moulds.

Dampness in any degree is conducive to the rapid growth of moulds, therefore, every precaution should be taken to ensure that the nesting material is dry and clean, and that the eggs and fillers used for the packing of eggs are dry.

Two recent examples of how easily the quality of eggs may be depreciated are cited:—In one case it was found necessary, because of a muddy poultry run, to wash every egg. The washing was well done, stains were removed with an odourless sandsoap, and the eggs were clean when packed; but, unfortunately, they were packed in strawboard fillers, with a slight bead of moisture on the shell. In the course of two days, when these eggs reached the market, there were quite a number of rots. As the poultry farmer concerned had a reputation for marketing good eggs, the agent retained the eggs that were apparently good on arrival for a further two days, but, on testing, many more rots were found.

The second case was that of a farmer who had well-grassed runs for his fowls. Although nests were provided, many of the hens nested in the grass. Complaints as to the quality of the eggs were received by the agent to whom these eggs had been consigned, with the result that the next consignment of eggs to reach the floors were carefully candled. Candling disclosed a number of rots. Those that were in, apparently, good condition were retained on the floors for another two days and again candled, when more rots were revealed. This led to an investigation by the Department of Agriculture, when it was found that only the eggs that had been laid in the grass were affected, and that the rottenness was caused by mould growths which had gained access through the pores of the shell. Providing the hens with more clean nests and discouraging them from laying in the grass corrected the trouble.

In these two examples it will be seen how easily the quality of eggs can be affected, and that it is essential—particularly during hot, humid weather—to protect eggs from decomposition caused by moulds.

Marketing Table Poultry.

In order to secure the highest returns, it is necessary to market poultry for table purposes in the best possible condition. The term condition can be taken to mean the state of the feather, flesh, and age of the bird. If culling of the layers receives the attention that it should, little can be done by the poultry raiser to improve the returns that he will receive from culled hens.

Experiments have indicated that the flesh carried by a well-fed hen that has finished production cannot be increased economically by

a system of feeding, and that the hen that has lost weight due to egg production takes too long to respond to a course of feeding. The best practice, therefore, is to market culled hens before they become a mass of pin feathers. This condition applies particularly at this time of the year.

Just now, the correct marketing of cockerels is of particular importance. This class of fowl sells reasonably well at any stage of development, if the bird is sold before it reaches what is known as the "staggy" stage. This term is applied to birds commencing to show spur development. In order to obtain the maximum value for cockerels for table purposes, they must be sold while the spur is still in the bud stage. Many breeders keep cockerels until this stage has passed, and, consequently, do not get top prices.

In the marketing of cockerels, it is as well to examine the feather growth. Cockerels with a lot of pin feathers do not dress attractively. This applies particularly to birds such as the Australorp, because of the colour of the plumage. Pin feathers on white feathered birds are not so noticeable.

Again, certain breeds are not well-fleshed at all times. This applies generally to the bigger birds—such as the Light Sussex and the Rhode Island Red.

To summarise—poultry raisers with cockerels to market should, firstly, bear in mind the fact that birds with indications of spur development do not realise the maximum value; secondly, that the rate of development of cockerels from twenty to twenty-four weeks of age is not as great as that which takes place earlier, consequently any increase in body weight is at a greater cost; and thirdly, that it is undesirable to market cockerels carrying a lot of pin feathers, and those that are scraggy and not well fleshed.

ANOTHER TYPE OF BUSH GATE.

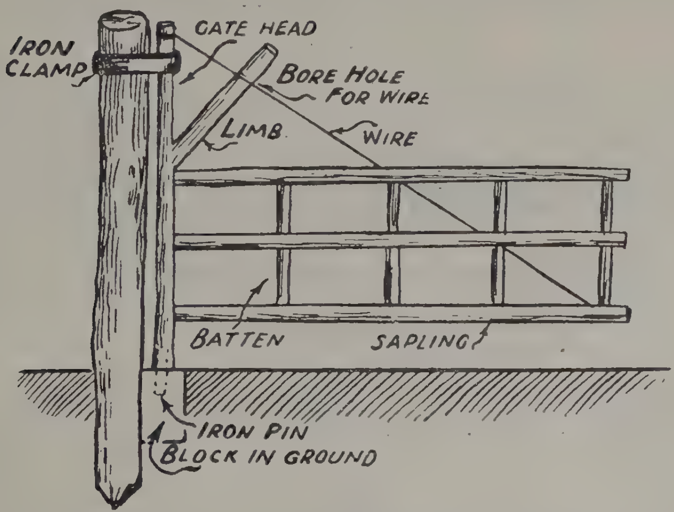


Plate 71.

Get a medium-sized sapling, forked as shown in the drawing, also three small saplings and fencing wire. With those materials, the diagram shows how a neat, handy, and cheap gate can be built.

Fertilizer Facts for Farmers.

F. B. COLEMAN, Officer in Charge, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

THE present Fertilizers Act is based on the experience of past years and came into active operation on 1st January, 1936, when the then existing Act was repealed.

Fertilizers are used for the purpose of supplying to the soil for the use of plants nitrogen, phosphoric acid, potash, and in some cases where required sulphur, magnesia, and, more rarely still, boron and other elements. All these may be termed the *active constituents* of the fertilizer in which they are contained.

With the exception of sulphur, these active constituents are not applied chemically pure, because of price, over-concentration, and non-availability to the plant; but are applied in compounds or mixtures in which they are present in varying amounts.

The actual "straight" fertilizers that are now upon the Queensland market are—

Nitrate of soda	Meatworks fertilizer
Sulphate of ammonia	Basic phosphate
Dried blood	Nauru phosphate
Superphosphate	Sulphate of potash
Bone dust	Muriate of potash.

A large proportion of the fertilizer distributed in Queensland is sold in the form of mechanical mixtures—*i.e.*, mixtures containing two or more of the abovementioned "straight fertilizers" in varying quantities—with the exception of basic phosphate and Nauru phosphate, which are not now used in mixtures.

The composition of the various straight fertilizers is set out in the following, but it should be understood clearly that the proportions vary and the figures given should be taken merely as a guide.

NITRATE OF SODA.

Nitrate of soda, the product of Chile, is a soluble salt that is found in rainless areas. It is mined and passed through various purification processes. The present granular nitrate of soda is a free-running, much superior material to the old damp, lumpy material of a few years ago. Its composition is as follows:—

	Per cent.
Nitrate of soda	95 containing 15·6 per cent. nitrogen
Common salt	1
Sulphate of soda ..	½
Other salts (mag. potass., etc.)	1
Insoluble	¼
Water	2¼
	100 per cent.

In other words, nitrate of soda is composed of nitrogen combined with oxygen and sodium to approximately 95 per cent. with approximately 5 per cent. impurities.

SULPHATE OF AMMONIA.

Sulphate of ammonia is composed of ammonia in combination with sulphuric acid. It may be manufactured in several ways, and has a small percentage of impurities associated with the method of manufacture. Its composition may be set out as follows:—

	Per cent.
Sulphate of ammonia ..	97·1 containing 20·6 per cent. nitrogen
Moisture and impurities ..	2·9
	100 per cent.

Sulphate of ammonia of 21 per cent. nitrogen content would naturally have a slightly lower percentage of impurities.

Sulphate of ammonia is manufactured either as a by-product of gasworks or—in Europe and America—fixed from the air. In simple terms, it is composed of nitrogen and oxygen from the air, hydrogen from water, and mined sulphur.

ROCK PHOSPHATE.

(Nauru or Ocean Island.)

A good sample of Nauru phosphate rock may be analysed as follows:—

	Per cent.
Tricalcium phosphate ..	87·0 containing 39 per cent. phosphoric acid
Calcium carbonate ..	4·5
Calcium fluoride ..	1·0
Free water	1·5
Organic matter	0·5
Impurities: Iron, alumina, silica, insoluble, &c.	5·5
	100 per cent.

The percentage of phosphoric acid ranges actually from 37 to 39, and 37 may be taken as a safe guarantee. This material is obtained from Nauru and Ocean Islands.

This rock phosphate is used for the manufacture of superphosphate.

SUPERPHOSPHATE.

The process of manufacture involves the grinding of Nauru or Ocean Island phosphoric rock to a very fine degree, and then mixing with approximately equal proportions of sulphuric acid, which process renders almost all of the insoluble phosphoric acid in the rock phosphate water-soluble.

In other parts of the world very cheap superphosphates are obtainable, because of their low water-soluble phosphoric acid content. In Australia the "super." sold is as high a grade as is sold anywhere in the world, excepting, of course, "double super."

Composition of superphosphate—

	Per cent.	
Water-soluble phosphate of lime ..	35	containing 20.5 per cent. water-soluble phosphoric acid
Free phosphoric acid	1	
Citrate-soluble phosphate of lime ..	$1\frac{1}{2}$	containing 0·5 per cent. citrate-soluble phosphoric acid
Insoluble phosphate of lime	$2\frac{1}{2}$	containing 1 per cent. insoluble phosphoric acid
Calcium sulphate (including gypsum)	48	
Moisture	7	
Impurities (silica, &c.)	5	
	100 per cent.	

The following figures, often met with, are explained respectively thus:—

20·5 *per cent. phosphoric acid*: This refers to the water-soluble phosphoric acid present.

22 *per cent. super.*: This refers to the total phosphoric acid—

20·5 per cent. water-soluble
0·5 per cent. citrate-soluble
1·0 citrate insoluble

22.0 per cent. total

45 *per cent. soluble phosphate:* This is a theoretical calculated figure obtained by converting 20·5 per cent. water-soluble phosphoric acid to tricalcic phosphate, which is the insoluble calcium phosphate (occurring in bone and rock phosphate).

48 *per cent. tricalcic phosphate*: This is a theoretical calculated figure obtained by converting the 22 per cent. total phosphoric acid to tricalcic phosphate.

It should be noted that all the above expressions are used in connection with the one superphosphate on the Queensland market; the only useful figure for comparison, however, is the 20·5 per cent. water-soluble phosphoric acid.

Superphosphate is not made in Queensland. Our supplies are obtained from Port Kembla and Cockle Creek, both of New South Wales. The Queensland consumption does not warrant the erection of a manufacturing plant here as yet.

BASIC PHOSPHATE.

This is manufactured by mixing superphosphate with lime in varying proportions.

This causes the water-soluble phosphoric acid to alter or revert to what chiefly is citrate-soluble phosphoric acid. It contains 17 per cent. citrate-soluble phosphoric acid. This material has a limited use and is not included in mixed fertilizers in Queensland.

SULPHATE OF POTASH.

This is composed of—

	Per cent.	
Sulphate of potash ..	92	containing 50 per cent. potash.
Other sulphates and chlorides	7	
Water	1	
	100 per cent.	

The potash content varies from 48 to 50 per cent.

CHLORIDE (MURIATE) OF POTASH.

This is composed of—

	Per cent.	
Chloride of potash ..	82	containing 52 per cent. potash.
Common salt	14	
Other sulphates and chlorides	3	
Water	1	
	100 per cent.	

The potash content varies from 50 to 52 per cent.

Our potash supplies come from France, Germany, and the Dead Sea in Palestine. Before the upheaval in Spain we drew some supplies from that country.

MEATWORKS BY-PRODUCTS.

These materials, being of organic origin—as will be seen—vary in composition. It is possible that materials of different nitrogen and phosphoric acid content to those set out below may be met with occasionally.

Blood.—The following composition is typical:—

	Per cent.	
Crude proteins ..	81¼	containing 13 per cent. nitrogen.
Moisture .. .. } Organic matter, &c. }	18¾	
	100 per cent.	

Usually the dried blood on the Queensland market contains from 11 to 13 per cent. of nitrogen.

Bone.—An average quality bone dust is composed of the following:—

	Per cent.	
Crude protein ..	22	containing 3½ per cent. nitrogen.
Tricalcic phosphate of lime	50	containing 23 per cent. phosphoric acid.
Moisture .. .. } Organic matter, &c. }	28	
	100 per cent.	

Bone dust in Queensland contains from 3 to 3·5 per cent. nitrogen and 22 to 23·5 per cent. phosphoric acid. Generally speaking, the more the bone is subjected to steam heating or sterilising, the lower becomes the nitrogen and the higher the phosphoric acid.

Highly sterilised bone is sold as a stock food and may contain less than 1 per cent. of nitrogen and over 30 per cent. of phosphoric acid.

Meatworks is composed of flesh, bone, and sometimes blood; it can have the following analysis:—

	Per cent.
Crude protein ..	37½ to 18¾ containing 6 to 3 per cent. nitrogen.
Tricalcic phosphate of lime	31 to 50 containing 14 to 23 per cent. phosphoric acid.
Moisture .. .. } Organic matter, &c .. }	31½
	100 per cent.

It should be noted that as the nitrogen increases the phosphoric acid decreases and *vice versa*.

In explanation of the figures given above, it may be stated that nitrogen may be converted to crude protein by multiplying by 6¼.

MIXED FERTILIZERS.

Having reviewed the chief fertilizers that are used in Queensland to compound mixtures, we will now address ourselves to the task of making up some mixed fertilizers from formulæ.

As a start, we will make a mixture of equal parts by weight of the following ingredients, and consider the resulting figures.

Material used.	*Contains.*
Sulphate of ammonia	20·6 per cent. nitrogen.
Superphosphate ..	20·5 per cent. water-soluble phosphoric acid.
Bone	3.5 per cent. nitrogen as bone. 23·0 per cent. phosphoric acid as bone.
Chloride of potash ..	52·0 per cent. potash as chloride.

Amount of Material used.	*Calculated per cent. obtained.* Nitrogen. Per cent.	Phosphoric acid. Per cent.	Potash. Per cent.
25 per cent. sulphate of ammonia	5·15	—	—
25 per cent. superphosphate ..	—	5·12	—
25 per cent. bone	0·87	5·75	—
25 per cent. chloride of potash ..	—	—	13
100 per cent.			

The Fertilizers Act requires a minimum guarantee to be stated on the label. To obtain this and make provision for variations, errors, &c., it is the practice to use an overrun allowance when compounding mixed fertilizers. In compiling the labels herein mentioned an overrun allowance of 7½ per cent. has been made.

A label for the mixture set out above, if offered for sale, would read as follows:—

..........................Fertilizer Mixture.

....................lb. net.

4.7 per cent. nitrogen as sulphate of ammonia
.8 per cent. nitrogen as bone
4.7 per cent. phosphoric acid water-soluble
5.3 per cent. phosphoric acid from bone
12.0 per cent. potash as chloride (muriate) of potash

Fine..............................per cent.

Coarse..........................per cent.

Name and address of seller or manufacturer.

"Fine" and "coarse" is explained later.

Now, by adding the various active constituents together, we obtain 5·5 per cent. nitrogen, 10·0 per cent. phosphoric acid, and 12·0 per cent. potash. This would be classed as a $5\frac{1}{2}$-10-12 mixture.

These figures should be used always in the sequence of nitrogen, phosphoric acid and potash, and are designated the *grade formula.*

Now, supposing some one desired a $4\frac{3}{4}$-$8\frac{1}{2}$-$10\frac{1}{4}$ mixture, it could be compounded as follows:—

Amount of Material used.	*Calculated per cent. obtained.*		
	Nitrogen. Per cent.	Phosphoric acid. Per cent.	Potash. Per cent.
20 per cent. sulphate of ammonia	4·1	—	—
20 per cent. superphosphate	—	4.1	—
20 per cent. bone	0·7	4·6	—
20 per cent. chloride of potash	—	—	10·4
20 per cent. filler (sand)	—	—	—
100 per cent.	4·8	8·7	10·4

From this it must be realised that it is not possible to compound any *grade formula* picked, at random, in such a way as to give a complete ton of fertilizer; *a filler may have to be used.*

Consequently, this aspect should be considered before some *fancy grade formula* is requested. Even if a filler can be obtained for nothing, freight, handling, and mixing costs must still be paid on it.

If this material is to be offered for sale, a label, after making an overrun allowance, should read—

Fertilizer Mixture.

....................lb. net.

3.8 per cent. nitrogen as sulphate of ammonia
.6 per cent. nitrogen as bone
3.8 per cent. phosphoric acid water-soluble
4.3 per cent. phosphoric acid as bone
9.6 per cent. potash as chloride (muriate) of potash
*20 per cent. sand

Fine..............................per cent.

Coarse..........................per cent.

Name and address of seller or manufacturer.

* See "Filler" (page 162) *re* labelling.

It will be observed that the grade formula now would be $4\frac{1}{4}$-8-$9\frac{1}{2}$, the figures having been taken to the nearest quarter below the actual total per cent. present.

FINENESS.

All organic fertilizers—i.e., blood, bone, and meatworks—depend upon their fineness of division to a great extent for their availability—i.e., the finer they are the greater is the surface exposed, and the more quickly does decomposition take place.

The regulations prescribe the following standards for fineness:—

	Fine. Material that passes through apertures of	*Prohibited.* Material that will not pass apertures of
Bone	$\frac{1}{50}$ in. square	$\frac{1}{10}$ in. square
Blood, Meatworks, Mechanical mixtures	$\frac{1}{50}$ in. square	$\frac{3}{16}$ in. square
Rock phosphate, Phospho guano	$\frac{1}{50}$ in. square	$\frac{1}{8}$ in. square
Lime	$\frac{1}{100}$ in. square	$\frac{1}{8}$ in. square

"Coarse" material is the particles that are larger than "fine" and smaller than "prohibited."

Under the old Act and Regulations provision was made for "unspecified" and "unspecified lumps." This very coarse material now is prohibited.

It should be understood clearly that the percentage of "Coarse" shown on labels of mixtures is actually the organic material only, except in the case of lime, rock phosphate, and phospho guano.

The method of analysis provides that all chemical material (almost completely water-soluble or capable of being broken down by water) shall be washed out, and the organic, blood, bone, flesh, and offal only shall be "tested for fineness." The percentage of "coarse" is the percentage of the insoluble organic material present in the mixture.

FILLER.

On and after 1st October, 1937, any fertilizer containing a filler must show on the label the percentage of the same. "Filler" is any material contained in any fertilizer that does not contain nitrogen, phosphoric acid, potash, sulphur, or magnesia, in appreciable quantities.

For instance:—

Earth,	Sawdust,
Ashes,	Antbed, &c.,

They are merely added, as explained above, to make the weight of fertilizer up to a ton—or for other less worthy reasons.

A clearer explanation would be—

Sulphate of ammonia is not filler, because it is used to supply nitrogen.

Superphosphate is not filler, because it is used to supply phosphoric acid.

Nauru rock is not filler, because it is used to supply phosphoric acid.

Sulphate of potash is not filler, because it is used to supply potash.

Cotton seed meal is not filler, because it could be used to supply nitrogen.

Magnesium sulphate is not filler, because it is used to supply magnesia.

CALCULATIONS.

In order to assist in the explanation as to how to obtain the weight of ingredients to use, to obtain a certain guarantee, or the guarantee that would result from the use of any proportion of ingredients in a mixed fertilizer, the use of questions and answers has been resorted to.

Calculations have been made to the nearest pound only.

Question.—How much sulphate of ammonia shall I use in 1 ton to obtain 5 per cent. of nitrogen?

Answer.—Formula to use:—

$$\frac{\text{Total weight required} \times \text{Per cent. of Active Constituent required}}{\text{Per cent. of Active Constituent in Ingredient used}} = \text{Weight of Ingredient to be used.}$$

Calculation—

$$\frac{2{,}240 \text{ lb.} \times 5}{20{\cdot}6} = 544 \text{ lb.}$$

Therefore, 544 lb. of sulphate of ammonia (containing 20·6 per cent. nitrogen) in 1 ton of fertilizer would give 5 per cent. nitrogen.

Question.—If I use 544 lb. of sulphate of ammonia (containing 20·6 per cent. nitrogen) in 1 ton of fertilizer, what would be the percentage of nitrogen present?

Answer.—Formula to use:—

$$\frac{\text{Weight of Ingredient used} \times \text{Per cent. Active Constituent in Ingredient used}}{\text{Total Weight}} = \text{Per cent. Active Constituent present.}$$

Calculation—

$$\frac{544 \text{ lb.} \times 20{\cdot}6}{2{,}240} = 5 \text{ per cent. Nitrogen.}$$

Therefore, 5 per cent. nitrogen, as sulphate of ammonia, would be present in 1 ton of fertilizer containing 544 lb. of sulphate of ammonia.

The various other percentages obtainable from different ingredients would be calculated similarly.

In calculating the above, an overrun allowance has not been made, and should be provided for if it is intended to offer fertilizers for sale.

LIME.

The Fertilizers Act applies to lime for agricultural purposes as well as to fertilizers. This has been dealt with very comprehensively in the *Queensland Agricultural Journal* of January, 1937.

THE FERTILIZERS ACT OF 1935.

The following are the main requirements of the Fertilizers Act:—

Every dealer must be licensed to sell fertilizer and lime for agricultural purposes (cost £1 1s. yearly).

Every fertilizer or lime must be registered yearly.

Every sale of fertilizer or lime over the value of 10s. must be covered by an invoice and warranty.

Every bag of fertilizer or lime must be labelled.

Every bag of fertilizer must be branded with the brand and name of the fertilizer.

Any buyer who desires to have an analysis made of a fertilizer or lime that he has purchased, must give notice to the seller, within fourteen days of delivery, of his intention to have it analysed, and must also comply with the provisions set out in Regulation 15 under the Fertilizers Act.

OFFENCES.

The Fertilizers Act is for the purpose of protecting buyers, and any irregularity, actual or suspected, should be reported immediately to the Fertilizers Branch in order that investigation and necessary action may be taken at once.

EXPLANATION OF TERMS.

The following terms, often met with, have the meanings as set out hereunder:—

N	= Nitrogen
P_2O_5	= Phosphoric acid
K_2O	= Potash
Super.	= Superphosphate
Sulp. amm. or amm. sulp.	= Sulphate of ammonia
Pot. chlor. .. .. / Muriate of potash ..	= Potassium chloride
Tricalcic phosphate of lime	= Phosphoric acid and lime in combination in the insoluble form

Grade formula expresses the respective percentages of nitrogen, phosphoric acid, and potash in the order given and guaranteed to be present by the dealer in mixed fertilizers, such as 5½-10-12.

Sale of Seeds.

REGULATORY LEGISLATION.

F. B. COLEMAN, Officer in Charge, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

Definition of Vendor.

A VENDOR under the Seeds Act is any person who sells or offers or exposes for sale or contracts or agrees to sell or deliver any seeds for sowing.

Seeds Sold in Made-up Packets to be Marked.

When seeds are sold in made-up packets or packages the following particulars shall be legibly and indelibly marked on the outside of each packet or package, namely:—

(*a*) The full name and address of vendor or packer;

(*b*) The kind and variety or strain of such seeds;

(*c*) The date after which the contents should not be used.

Prohibited.

The principal totally prohibited seeds are:—

Datura spp.	Thorn Apple
Cuscuta spp.	Dodder
Sorghum halepense ..	Johnson Grass

The following insects are also prohibited:—

Live—

Bruchophagus funebris ..	Lucerne Seed Chalcid Fly
Bruchus spp.	Bean, Cowpea, and Pea Weevils.
Sitophilus (*Calandra*) spp.	Grain Weevils;

and seeds infested with same in any stage of development. For full list of prohibited seeds, see Regulations.

Standards of Purity and Germination.

The Regulations under the Act prescribe the minimum germination and the maximum proportions or amounts of weed seeds, other crop seeds, and inert matter that may be present in the different kinds of seeds for sowing. A copy may be obtained on application to the Department of Agriculture and Stock, Brisbane. For list of the more important seeds, see Table I.

Efficient Seed-cleaning Machinery.

The Regulations do not apply to:—

Seeds sold by the actual grower direct to any vendor in possession of one or more efficient cleaning machines, for the purpose of the seeds being cleaned and graded before being offered for sale as seed for sowing.

Samples from Bulk in Sender's Possession.

Provision is made for the examination of samples at the Seed Testing Station, Brisbane, upon payment of the prescribed fee; seeds purchased for sowing, and not resale, are examined free.

TABLE I.

GERMINATION STANDARDS OF THE MORE IMPORTANT SEEDS.

(For full list, see copy of Regulations.)

Kind of Seed.	Germination by Count. Minimum.	Kind of Seed.	Germination by Count. Minimum.
	Per Cent.		Per Cent.
Barley	80	Lupins	60
Beans—		Maize	80
French	70	Mangel	*55
Mauritius	70	Marrow	70
Rice	75	Millets—	
Beet	*55	French	75
Cabbage	60	Foxtail	75
Carrot	50	Japanese	75
Cauliflower	60	Panicum	75
Clovers—		Setaria—Giant and dwarf	75
Red clover	75	White panicum	75
White clover	70	Oats	80
Cotton	70	Onion	50
Cowpeas	70	Parsnip	40
Cucumber	70	Peanuts	60
Grasses—		Peas	75
Blue panic—Giant panic	40	Pumpkins	70
Canary—Seed canary	65	Radish	75
Cocksfoot	60	Rape	70
Couch grass	40	Rockmelon	70
Molasses grass	20	Rye corn	80
Paspalum	20	Sorghum grain	70
Phalaris tuberosa	55	Sorghum saccharine	70
Prairie grass	65	Squash	70
Rhodes grass	30	Sudan grass	65
Rye grass—		Swede turnip	65
Italian	65	Tares	60
Perennial	65	Tobacco	60
Wimmera	65	Tomato	65
Leek	50	Turnip	65
Lettuce	75	Vetch	60
Lucerne	75	Watermelon	65
		Wheat	80

* Of clusters.

Sampling Instructions.

(1) When drawing samples, it is of the utmost importance that they be drawn by a responsible person and care be taken to make them truly representative of the bulk.

(2) To enable this to be done satisfactorily, approximately equal parts should be drawn alternatively from the top, middle, and bottom of the bags, the proportion of bags to be sampled being as follows:—

1 to 19 bag lots—A portion from each bag.
20 to 39 bag lots—A portion from each of not less than 20 bags.
40 to 59 bag lots—A portion from each of not less than 28 bags.
60 to 79 bag lots—A portion from each of not less than 32 bags.
80 to 99 bag lots—A portion from each of not less than 36 bags.
100 to 199 bag lots—A portion from each of not less than 40 bags.
200 bags and over—A portion from each of not less than 20 per cent. of the total number of bags.

(3) If, when drawing samples, it is observed that great variation occurs in the bulk, two or more samples should be obtained, each from bags whose contents are similar, and representing the variations that may have been noticed. These different lots should be marked with distinguishing marks, and the samples marked similarly.

(4) After a sample has been drawn as above indicated, it should be emptied out on to a large piece of paper, thoroughly mixed, and then a quantity not less than the prescribed weight for the particular kind of seed should be drawn for purposes of forwarding to the Seed Testing Station. A duplicate sample should be kept for reference.

(5) In the Seed Testing Station great pains are taken to ensure absolute accuracy of work. It therefore follows that all this care is wasted unless the person forwarding samples for examination takes some trouble to ensure that the samples drawn truly represent the bulks from which they are obtained. The minimum weight of such samples is as follows:—

TABLE II.

WEIGHT OF SAMPLES.

Kind of Seed.	Weight required.	Kind of Seed.	Weight required.
Barley	8 oz.	Panicum	4 oz.
Beans	8 oz.	Parsnip	½ oz.
Beet	½ oz.	Paspalum	3 oz.
Cabbage	½ oz.	Peanuts	2 lb.
Canary	4 oz.	Peas	8 oz.
Carrot	½ oz.	*Phalaris tuberosa*	3 oz.
Cocksfoot	3 oz.	Prairie grass	4 oz.
Couch	3 oz.	Radish	½ oz.
Cowpeas	8 oz.	Rhodes grass	3 oz.
French millet	4 oz.	Rice	8 oz
Grasses	3 oz.	Rye	8 oz.
Japanese millet	4 oz.	Rye grass	3 oz.
Linseed	4 oz.	Sorghum	4 oz.
Lucerne	4 oz.	Sudan grass	4 oz.
Maize	8 oz.	Tares	8 oz.
Mauritius beans	1 lb.	Tomatoes	½ oz.
Millets	4 oz.	Vegetable seeds in made-up packets	5 pkts.
Molasses grass	3 oz.	Wheat	8 oz.
Oats	8 oz.	White panicum	4 oz.
Onion	½ oz.		

Where seeds are stored loose in bulk, the samples shall be taken from various parts of the heap or bin, and shall be of the like proportion, as nearly as can be fairly estimated, as would be required if such seed were in bags, so that a representative sample of the whole bulk is obtained.

In the case of seeds not mentioned above, the weight set out for the seed of nearest size should be forwarded.

In the case of seeds obviously containing weed seeds or other impurities, not less than double the weight mentioned should be sent.

Marking of Samples.

All samples must be plainly written on in ink, setting out the undermentioned particulars:—

Sample of seed drawn from bags representing a total of bags.

Bags marked:—

Purchased from of on

Name of sender:

Address:

Date:

The examination of samples without name and address of sender cannot be undertaken.

Samples should be addressed as follows:—

Seed Sample for Examination.
Officer in Charge,
Seed Testing Station,
Department of Agriculture and Stock,
Brisbane.

Special care should be taken to securely fasten up the sample. The examination of samples that have been opened in transit is useless for any determination, as only a sample received intact can be taken as representing any bulk.

Fee and Covering Letter.

A covering letter, enclosing the prescribed fee, should be addressed to the Under Secretary, Department of Agriculture and Stock, Brisbane.

The fee for a copy of the result of any examination of any seeds shall be as follows:—

1. 2s. 6d. per certificate, or
2. (*a*) £3 10s. for the first fifty certificates, and thereafter 1s. per additional certificate during the twelve months ending 30th June—providing the sum of £3 10s. shall be paid in advance: Provided that—

   (*b*) In the event of any person claiming a refund of fees paid under 2 (*a*) on account of the number of certificates being less than fifty, such refund shall consist of the amount left after the charge of 2s. 6d. per certificate has been made.

Free Examination.

Samples representing seeds purchased by farmers for their own sowing are examined free of charge, providing that the full particulars as above are marked upon the sample, and a covering letter stating the purpose for which the seed is to be used is forwarded.

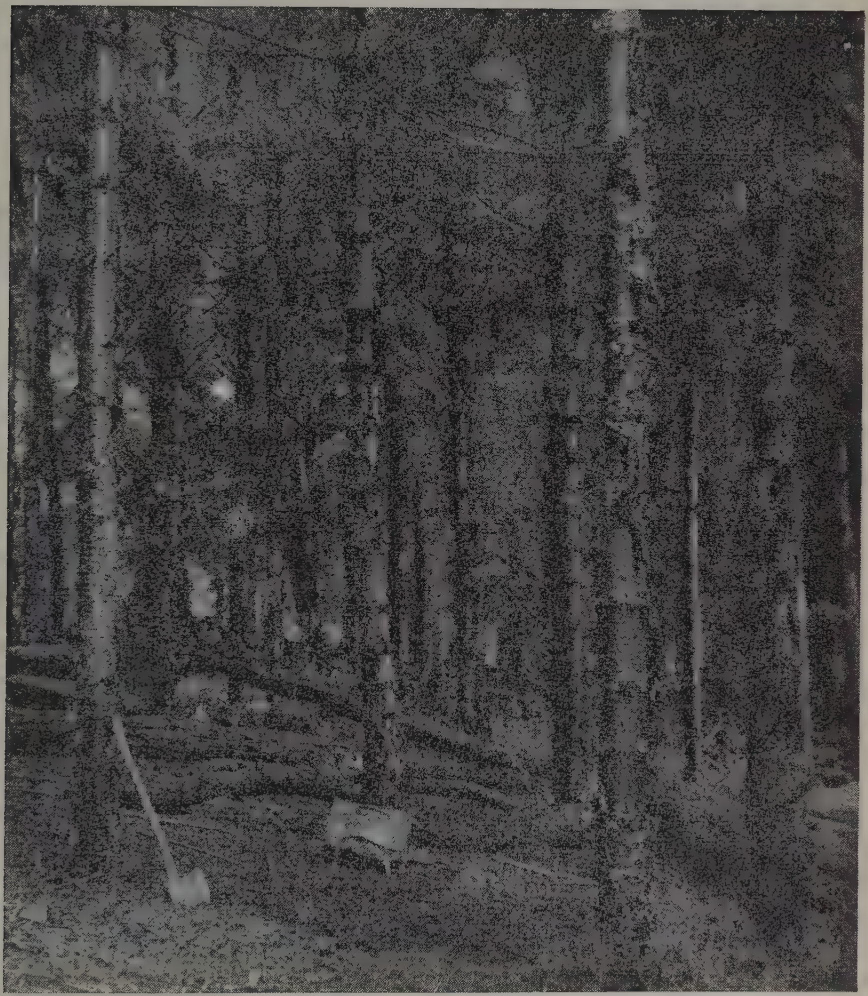
Complaints.

In case of any complaints regarding analytical purity or germination, the buyer should at once send a sample of the seed, marked with the

particulars as above set out, together with a covering letter to the Department advising of the despatch of the sample; this will be examined free of charge.

Examine Goods on the Day of Delivery.

Both buyers and sellers are urged to examine all goods on the day of delivery, and when in doubt regarding any seeds, fertilizers, veterinary medicines, pest destroyers, or stock foods, to write at once to the Department of Agriculture and Stock, Brisbane, in order that the matter may be at once investigated.



[*Photo. Forest Service.*

Plate 72.

A RAPIDLY GROWING ASSET.—A nine-year-old stand of Hoop Pine at Barron, North Queensland.

THE MEAT INDUSTRY.

The investigations of the Rural Development Committee of the Bureau of Industry indicated that the chilled-beef trade offered the best opening for the expansion of the Cattle Industry. Suppliers of live-stock for chilled-beef export purposes might be divided into two distinct types—Graziers; Farmers.

As to Graziers—

The Rural Development Committee propounded a set of factors which appeared to have an important bearing upon a successful scheme of chilled-beef export insofar as graziers were concerned. The factors enumerated were:—

(a) The requirements for a continuous supply of suitable beef cattle;

(b) The areas suitable for the breeding and fattening of such cattle;

(c) The pastures and other requirements for the continuous growth of the cattle to maturity in prime condition;

(d) The most effective procedure for transferring the cattle from breeding areas to fattening areas and from the fattening areas to the points of treatment for export;

(e) The relationship between the supply of such cattle and the supply of other livestock suitable for export trade;

(f) Generally, the most effective means of establishing the beef-cattle industry on a more satisfactory basis in relation to Queensland conditions and other industries.

These factors were weighty ones and satisfactory conclusions concerning them, and successful practical action based upon the conclusions, might have had an important influence upon the Cattle Industry and the chilled-beef export trade.

Under the aegis of the Bureau a conference of interested parties was held, but, apparently, the conference was abortive—and led to a position of stalemate.

As to Farmers—

Research by various Bureau Committees elicited much useful information. I summarise below some of the tentative conclusions which were reached—

(a) The average dairy farmer, if he is to meet his commitments and to provide employment for his sons, may be compelled to add some other source of income to his dairy activities.

(b) General agriculture does not afford an attractive avenue owing to recurring gluts, instability of prices, and small margins of profits.

(c) The auxiliary of raising fat stock, lambs, and pigs for the local and export markets may afford a moderately remunerative sideline if satisfactory arrangements could be made for group-marketing—say, through the butter and cheese factories. Coupled with this project should be the growing of more crops for conservation of fodder on the farm.

The orderly development of the meat industry is an important branch of State expansion, and it would appear desirable to explore the possibilities thoroughly, particularly as new paths to development are being sought so anxiously and the urge to help the small man is so strong.

But, seemingly, a stage has been reached when committees and conferences have ceased to be effective and when other methods should be tried. A comprehensive memorandum on the subject was submitted to the Chief Secretary.

—From the Annual Report of the Public Service Commissioner, Mr. J. D. Story, I.S.O.

REGISTERED STALLIONS.

Subjoined is a list of stallions in respect of which Certificates of Registration were issued under "*The Stallions Registration Acts*, 1923 *to* 1934," during the year 1937-38:—

BLOOD STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1937-38.

Name.	No.	Age.	Colour.	Owner.
Afghan	1944	Aged	Black	F. G. B. Gottwaltz, Powlathanga
Alcman	1996	Aged	Brown	C. H. Wright, Waverley, St. Lawrence
Amber King	1945	6	Bay	J. C. Alford, Mount Ravenswood
Andy Ra	1910	5	Dark bay	W. Northcott, Grange, Brisbane
Ardon's Pride	1911	6	Brown	A. E. Tucker, Hendra
Bachelor's Echo	1863	Aged	Bay	W. E. May, Clifton
Baldwin	1770	Aged	Brown	P. Hughes, Macdonaldtown, Toowoomba
Bally's Pride	2035	5	Brown	F. Schmidt, Eton
Beau Valette	2024	5	Chestnut	G. Skene, St. Alban's, Nebo
Bender Boy	1771	5	Bay	W. E. Stevens, Kogan
Blue Boy	2025	5	Grey	H. G. Walters, Proserpine
Bon Soldat	1912	5	Chestnut	J. Gault, Edward street, Brisbane
Bronzollo	1817	5	Chestnut	J. Daniels, Canungra
Brown Lock	1890	5	Bay	J. Reid, Glamorgan Vale
Bullomin	1913	5	Brown	L. C. Lawson, Grafton
Buzzalot	1946	5	Chestnut	H. Lanzen, Alice River, Townsville
Cadency	1914	5	Chestnut	W. Robson, Coraki, New South Wales
Cangou	1823	5	Chestnut	F. M. Hooke, Woolooga
Cannon King	1772	5	Chestnut	W. G. Douglas, Nutgrove
Careful Marcus	1997	Aged	Chestnut	A. E. Rankin, Duaringa
Carrawob	1773	5	Bay or Brown	D. A. Wormwell, Meandarra
Compodomico	1774	Aged	Bay or Brown	C. O. Frith, Taunton
Cool Valley	1915	5	Bay	Bergstrom and Hansen, Ascot
Daily Leader	1824	5	Bay	P. G. Allen, Cinnabar
Dandale	1775	5	Brown	V. W. Fysh, Pampas
David Hope	2026	Aged	Brown	E. Y. Shannon, Nebo
Demon Lad	2004	Aged	Bay	J. M. McCartney, Princhester
Eiderdown	1825	5	Bay	A. Lutvey, Gayndah
Ellcast	1776	5	Chestnut	R. C. Dickman, Chinchilla
Falmacre	1947	Aged	Brown	A. Parsons, Herberton
Fernside	1998	5	Brown	R. Beak, Wumalgi
Flight	2027	5	Blood Bay	M. C. M. James, Dow's Creek, Mirani
Fugaleye	1864	Aged	Chestnut	H. C. Bradford, Omanama
Gee Whiz	1948	Aged	Brown	Hedlef Brothers, Ravenswood
Golden Knight (imp.)	1949	Aged	Chestnut	Estate J. S. Love, Valley of Lagoons, Ingham
Golden Leaf	1950	5	Chestnut	J. Downey, Kirk River, Mingela
Gold Dust	1777	5	Bay	W. J. Brazier, Jandowae
Gozinate	2028	5	Brown	D. A. and S. O. Nielsen, Nebo
Grecian More	1916	Aged	Chestnut	F. Powell and Sons, Richmond, New South Wales
Grey Amber	1951	5	Grey	R. J. Atkinson, Mount Garnet
Grosnet	1778	5	Bay	H. A. Clark, Westbrook
Gunfelt	1917	5	Bay or brown	W. G. Anderson, Urandangie
Havelock	1826	5	Brown	F. G. Willert, Goomeri
High Drama	1918	6	Bay	W. Northcott, Grange, Brisbane
High Order	1953	Aged	Bay	Gunnawarra Pastoral Co., Gunnawarra
Impish Boy	1954	5	Dark bay	Miss E. M. Lee, Mount Molloy
Ishmail (Arab)	2019	6	Iron grey	Wilson and McDouall, Calliope
Jackoli	1999	5	Brown	Camboon Pastoral Co., Camboon
Jocular	1919	5	Brown	E. L. Ramsay, Cambooya
King Leo	1891	5	Bay	P. E. Grace, Boonah
King Logan	1827	5	Grey	D. A. Proctor, Byrnestown
L'Elite	1920	Aged	Chestnut	W. C. Keane, Dirranbandi
Leo Dear	1921	5	Bay	W. Wilson, Drake street, Hill End
Lilmatic	1828	6	Brown	W. J. Williams, Mungungo
Lobomin	1922	5	Bay	L. Dahl, Manson road, Hendra
Lord Downshire	1923	5	Bay or brown	H. J. Carter, Alfred street, Charleville
Magnet	2029	5	Brown	Bradshaw and Goodale, Gargett
Malt	1955	6	Brown	C. Simonelli, Ravenswood
Matelot	1829	5	Bay	H. S. Kent and Co., Gayndah
Mentoi	1818	5	Bay	J. T. Sherlock, Sherwood
Mont Blanc	1779	5	Chestnut	Grace Brothers, Boondoondilla Siding
Paine Raughton	2030	Aged	Brown	V. A. Toms, Mossvale, Jaraga
Pathfield	2031	5	Chestnut	F. Smith, Beaconsfield, St. Lawrence
Perlo	2032	5	Iron grey	T. and C. Nielsen, Eton
Petition	1830	6	Bay	T. J. Downey, Gooroolba
Problem	2000	5	Brown	Archer Brothers Pty., Biloela
Rallier	1956	Aged	Black	Estate H. J. Alkinson, Wyandotte
Richmond	2033	Aged	Bay	M. M. Gordon, Grosvenor Downs
Ruffian	1924	6	Brown	M. F. Yore, Logan Village
Sea Laddie	1892	5	Black	T. J. Ford, Gatton
Senator	2001	5	Bay	R. G. Mackay, Morinish
Server	1831	5	Bay	S. McCracken, Bundaberg
Silver	2002	5	Grey	A. W. Christiansen, Raglan
Simon	1832	5	Chestnut	Perrett Brothers, Kinbombi
Sir Foot	2034	Aged	Brown	W. H. Bradshaw, Nebo
Sir Rally	1957	5	Black	J. Irwin, Ewan
Snowfire (imp.)	1780	Aged	Bay	P. Hughes, Toowoomba
St. Carmen	1781	6	Brown	J. D. Wormwell, Dalby
Strathalvon	1958	Aged	Brown	C. Suhr, Ravenswood
Syce Tune	1833	Aged	Bay	H. Barber, Mungungo

Blood Stallions Certificated for Life during Year 1937-38—*continued.*

Name.	No.	Age.	Colour.	Owner.
Sydney Lad	1925	5	Bay	G. F. Goodrich, Inglewood
Taubada	1782	5	Bay	Mrs. R. V. Broydon, Haden
Tauber	1926	5	Bay	B. C. Bell, Aroo, Boonah
Three Cheers	1959	Aged	Bay	G. and M. Core, Blue Range, Charters Towers
Trent Bernie	1834	5	Chestnut	J. Frame, Inverlaw, Kingaroy
Tripple Gleam	1960	Aged	Bay	J. H. Alkinson, Greenvale, Charters Towers
Unbrave	1927	5	Chestnut	P. Venaglia, Wilsonton
War Arm	1783	5	Bay	R. J. Barry, Jandowae
Waratah	1835	5	Bay	G. W. Nahrung, Miva
Warrigal	1784	5	Chestnut	J. F. Lowien, Wutul
Warwick Bachelor	1785	5	Brown	F. J. C. Martin, Kumbarilla
Warwick Love	1961	Aged	Bay	J. Rollinson, Homestead
Weir Wedge	1786	5	Brown	F. G. Searcy, Kinkabilla
Wide Bay	1787	6	Bay	J. C. Clark, Daandine, Dalby
Winbow (5th)	2003	Aged	Brown	Estate Geo. Creed, Raglan

Pony Stallions Certificated for Life during Year 1937-38.

Name.	No.	Age.	Colour.	Owner.
Ankor II.	1865	5	Grey	W. Gilmore, Allora
Basra	1819	5	Bay	D. McDougall, Veresdale
Black Pride	1820	5	Black	J. T. Collett, Pomona
Bonny Gem	1811	5	Bay or brown	E. J. Ezzy, Kooroongarra
Boonah's Pride	1893	5	Black	G. E. Kirchner, Boonah
Bruno	1866	Aged	Cream	H. Redington, Goondiwindi
Darby	1837	5	Chestnut	L. J. Mackaway, Goomeri
Golden Laddie	1894	5	Chestnut	W. H. Strasburg, Lark Hill
Hope	1930	5	Brown	R. C. Draney, Townson
Johnnie	1838	5	Cream	F. M. Hooke, Woolooga
Kailhan	1839	Aged	Bay	R. B. Jefferies, Nanango
Little Sam	1840	5	Black	E. O. Althause, Cloyna
Mark Twain	2020	Aged	Grey	Archer Bros. Pty., Ltd., Biloela
Master Cypher	2021	5	Brown	Miss E. E. Perrier, Mount Larcom
Master Ludo	1931	5	Brown	Mrs. M. E. S. Bates, Eagle Farm
Migalo	1841	5	Bay or brown	M. J. Daly, Murgon
Nifty Jim	1932	5	Bay	W. G. Blomfield, Miriam Vale
Paddy	2022	5	Brown	J. G. McCartney, Marlborough
Ramadi	1812	5	Grey	J. V. Willis, Meringandan
Rex	1963	Aged	Black	C. R. Mortimer, Tarzali
Royalty	1964	5	Bay	J. M. McCloskey, Plum Tree
Shumar	1813	5	Chestnut	G. G. Wilson, Bell
Silver Prince	1842	6	Chestnut	F. M. Hooke, Woolooga
Springmeade Bright Lad	1933	5	Bay	Ziesemer Bros., Bonjean
Tim	1814	5	Black	A. Tame, Kulpi
Tom Thumb	1965	Aged	Blue grey	W. Squire, Ravenswood
Toomba	1966	Aged	Flea bitten grey	Bell and Hatfield, Caerphilly, Charters Towers
Wee Georgie	1934	6	Iron Grey	A. J. McPhie, Ulmarra, New South Wales
Wild Fire	1895	5	Chestnut	A. Moore, Mount Forbes, Rosewood

Trotter Stallions Certificated for Life during Year 1937-38.

Name.	No.	Age.	Colour.	Owner.
Belmont Boy	1836	5	Bay	S. R. Steele, Proston
Cole Sound	1928	5	Bay	W. D. Dale, Marburg
Direct Dean	1896	5	Bay	C. A. J. Tillack, Laidley
Dynamite	1897	5	Bay	H. Gon Chee, Esk
Prince Pronto	1815	Aged	Bay	P. Hughes, Macdonaldtown, Toowoomba
Raven Dean	1816	5	Bay	Mrs. C. Bruhl, Cecil Plains
Sylmo	1962	5	Chestnut	Jas. Campbell, Oonoomba
The Sail	1929	Aged	Bay	D. Sharp, Ekebin
Vicks	1821	Aged	Bay	F. Pryor, Verrierdale, Eumundi
Young Afghan	2023	Aged	Brown	E. Griffiths, Dumbleton, Mackay

Draught Stallions Certificated for Life during Year 1937-38.

Name.	No.	Age.	Colour.	Owner.
Adventist	2005	Aged	Bay	Estate Geo. Creed, Raglan
Aerial Mail	2006	5	Bay	Camboon Pastoralist Co., Camboon
Arraglen	1843	5	Bay	Pownall and Pownall, Mahoon
Attraction	1844	5	Bay	R. T. Jones, Didcot
Barana Comet	1967	Aged	Chestnut	C. E. Deane, Hodel, Townsville
Barney	1968	Aged	Grey	R. C. Ramsay, Mingela
Baron Knight	1845	5	Bay	S. and B. Scotney, Moorland
Beau Laddie	1898	5	Bay	S. J. Draper, Stoney Creek
Ben Attow	1969	5	Bay	P. F. King, Home Hill
Black Prince	1970	Aged	Black	J. H. Alkinson, Greenvale, Charters Towers
Bonnie Intent	1846	5	Bay	W. E. Elsebach, Gayndah
Boree Wallace	1867	Aged	Brown	P. J. Wilson, Elphinstone
Bowler	1971	Aged	Brown	A. Peagham, Pentland
Boxer	2007	5	Brown	N. W. Meissner, Biloela
Bright	1972	Aged	Bay	Eliza E. Rollinson, Balfe's Creek
British Lion	2008	Aged	Bay	R. Beak, Wumalgi
British Prince	1847	5	Bay	C. F. Draheim, Murgon
Brooklyn Keynotes Sport	2009	5	Bay	R. Beak, Wumalgi
Brown Dale	2010	5	Brown	J. B. Shannon, Tooloombah

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING YEAR 1937-38—*continued.*

Name.	No.	Age.	Colour.	Owner.
Burrundale George ..	1848	5	Bay ..	J. E. Stanton, Goomeri
Captain	1849	Aged	Bay ..	Hunter Bros., Cinnabar
Captain	1850	5	Bay ..	J. T. Mulcahy, Nanango
Captain Shepherd ..	1788	5	Brown ..	M. G. Polzin, Douglas, Goombungee
Captain Wallace ..	1851	5	Brown ..	A. Perrett, Coolabunia
Captain Wallace ..	1899	5	Bay ..	W. E. Houston, Blackbutt
Carlyle Pet	1789	5	Bay ..	A. R. and R. C. Curd, Jandowae
Cedric	1790	5	Black ..	E. C. Stark, Pinelands, Crow's Nest
Chieftain	2036	5	Bay ..	W. Foan, Sarina
Chieftain	2037	5	Bay ..	D. P. Markey, Boldon, Mackay
Chieftain	1868	5	Bay ..	Estate E. Jowett, Clifton
Clematic Flash Mac ..	1900	5	Brown ..	J. M. Newman, Caboolture
Clinker	1869	5	Bay ..	V. Osborne, Cobba-da-mana
Commander	1935	5	Bay ..	G. H. Burrows, Tasmania
Craiglea Again ..	1973	6	Dapple brown	J. Williams, Ingham
Crown	1974	Aged	Dark bay ..	G. F. Crowley, Mount Leyshon
Crystal	1975	6	Grey ..	B. Lynn, Ingham
Crystal Boy	1901	Aged	Bay ..	S. Webster, Kilcoy
Crystal King	1852	5	Brown ..	J. B. Edwards and Son, Kingaroy
Cypress Grove Baron Vue	1936	Aged	Bay ..	Forge Bros., Tamworth
Dale	2038	5	Bay ..	W. H. Gillham, Suttor Creek, Nebo
Dangar	1993	Aged	Chestnut ..	J. Barker, Oak Hills, Ingham
Diamond King ..	1976	6	Bay ..	G. Altoft, Macknade
Dijon	1977	Aged	Dapple grey ..	T. H. Baker, Mount Molloy
Dollfuss	1853	5	Brown ..	E. Reinbott, Booie
Don	1978	Aged	Dark bay ..	P. Catrastellero, Victoria East, Ingham
Dragon	1870	5	Bay ..	G. S. Burns, Goondiwindi
Duke of Gloucester ..	1871	5	Bay ..	J. Little, Cobba-da-mana
Duke of Windsor ..	1872	5	Bay ..	G. Wickham, Karara
Earl Marshall ..	2039	6	Bay ..	G. W. Orchard, Parapi
Fashion Prince ..	1873	6	Bay ..	Dwan and Sons, Deuchar
General Dale ..	1979	5	Brown ..	P. F. King, Home Hill
George Wallace ..	1874	5	Bay ..	T. J. Lyons, Clinton Vale
Glenroy	2040	5	Black ..	A. Parkinson, Finch Hatton
Grove King	2041	5	Bay ..	B. J. Langford, Finch Hatton
Haile Selassie ..	2042	5	Brown ..	N. Mackay, Mirani
Hero	1875	Aged	Black ..	E. E. Gray, Cobba-da-mana
Highland Greyboy ..	2043	6	Grey ..	A. Petersen, Homebush road, Mackay
Highland Sensation ..	1980	Aged	Black ..	C. B. McPherson, Mingela
Intent's Pride ..	1981	5	Bay or Brown	H. B. Burstall, Ayr
Jack	1822	5	Roan ..	D. Hose, Pomona
Jelbyn Jock	2044	5	Bay ..	Wright and Davidson, Kemmis Creek, Nebo
Jimmy	2011	6	Bay ..	C. Acutt, Kalapa
Johnnie Walker ..	1791	5	Bay ..	T. Gadsby, Woleebee, Jackson
Jondaryan Duke ..	1792	5	Bay ..	G. W. Hartmann, Bowenville
Jondaryan Maple ..	1793	5	Bay ..	W. P. O'Sullivan, Greenmount
Jondaryan Minstrel ..	1794	5	Bay ..	W. J. Lloyd, Harrow
Jondaryan Worthy Sheriff	1795	5	Bay ..	Miss E. Armstrong, Toowoomba
Kerlock	1902	5	Black ..	R. E. A. Schafferius, Ingoldsby
Kerr Lad	2045	5	Brown ..	E. Atherton, Koumala
Kerrston Lad ..	1903	5	Brown ..	S. H. Hallas, Gatton
Kimbar Mailboy Jack	1796	5	Bay ..	Alexander Bros., Inverai
King Wyllie	1904	5	Black ..	F. F. Harm, Plainland, Laidley
Lion	1854	5	Bay ..	W. Ellicombe, Mundubbera
Lord Darnley ..	1797	Aged	Bay ..	E. D. Jones, Cherwonda, Wandoan
Mac	1982	5	Bay ..	W. Conley, Ayr
Majorlace	1855	5	Black ..	H. Seiler, Wondai
Major Wallace ..	1877	5	Bay ..	E. J. Breen, Eukey
Major Wyllie ..	1983	Aged	Brown ..	J. B. Taylor, Malanda
Master Carlyle ..	1798	5	Bay ..	G. H. Bidstrup, Warra
Master Wallace ..	1878	5	Bay ..	T. O'Dempsey, Lower Freestone
Mountain View ..	2012	5	Bay ..	E. A. Russell, Thangool
Mount Irving Prince Alexander	1879	6	Bay ..	J. D. Hynes, Riverton, Tenterfield
My Intent	1880	5	Brown ..	T. Ryan, Greymare
Napoleon	1800	5	Bay ..	W. B. Dent, Glenmona, Warra
Newtown Intent ..	1984	Aged	Black ..	Estate H. J. Atkinson, Ingham
Ngaia Juvenal ..	1856	5	Bay ..	J. R. L. Hyne, Riversleigh
Noble	1985	Aged	Bay ..	G. Snodgrass, Yungaburra
Noble Hero	1801	5	Bay ..	E. Ehlrich, Oakey
Noble of Cashmere ..	1986	6	Bay ..	W. A. Jenkins, Julatten
Nugget	2046	5	Bay ..	E. A. Spearing, Carmila
Nuggett	2013	Aged	Bay ..	M. McGrath, Nankin Junction
O'Lad	1802	5	Bay ..	C. G. King, Goombungee
Peel River Monarch ..	1799	5	Bay ..	Currowah Pty. Ltd., Brookstead
Peter Jackson ..	1803	5	Bay ..	Baker Bros. Pty. Ltd., Bowenville
Pine Park Chief ..	1938	5	Bay ..	R. Stokes, Collingwood, Victoria
Pine Vale Mainmast ..	1939	5	Black ..	J. Hamilton, Forest Hill
Plucky Prince ..	2014	5	Bay ..	W. H. Davey, Baralaba
Pride of Fairview ..	1905	5	Bay ..	J. G. Tones, Sheep Station Creek, Kilcoy
Prince Chamberlain ..	1995	Aged	Bay ..	C. F. Schmid, Nikenbah
Prince Charles ..	1987	Aged	Bay ..	Estate J. S. Love, Gainsford, Charters Towers
Prince Dale	1857	5	Bay ..	F. C. Rekow, South Kalkie, Bundaberg
Prince Henry ..	1804	5	Bay ..	Bebbington Bros., Camboopa
Prince Roy	1805	5	Bay	P. G. Ruhle, Motley, *via* Oakey

DRAUGHT STALLIONS CERTIFICATED FOR LIFE DURING 1937–38—*continued.*

Name.	No.	Age.	Colour.	Owner.
Punch	2015	5	Bay	A. Thomasson, The Caves
Rare Champion	1906	5	Bay	H. A. Bartholomai, Boonah
Ravelrigg (imp.), N.Z.	1940	6	Brown	T. Robson, Crow's Nest, Sydney
Roan Tom	2016	6	Roan	J. B. Shannon, Tooloombah
Robin of Lilyvale	1941	5	Bay	J. O. Hagan, Belmont
Rob Roy	1907	5	Bay	H. Williams, Blackbutt
Royal	1858	5	Brown	J. A. Perkins, Mundubbera
Royal Banker	1881	5	Black	Hart Bros., Headington Hill, Clifton
Royal Mac	1859	5	Bay	J. McDermid, Monto
Royal Shepherd	1806	5	Bay	P. T. Dwyer, Maclagan
Royal Top	1882	5	Bay	A. N. McKechnie, Cottonvale
Scotsdale	1988	Aged	Bay	M. Laws, Malanda
Shamrock	1883	5	Bay	M. Bourke, Yangan
Silver	2047	Aged	Chestnut	R. J. Kelly, Jaraga
Sir Burton	2048	5	Brown	R. J. Aslette, Harrycrandt, Nebo
Sir Glancer	1989	6	Brown	Mrs. F. L. Doyle, Mareeba
Sir Pendennis	1884	5	Bay	B. Y. L. Peckman, Boggabilla, New South Wales
Sir William 2nd	1885	5	Chestnut	E. Homan, Killarney
Slogan	1990	6	Chestnut	J. M. McCloskey, Plum Tree, G.N.R.
Smoky	2017	5	Bay	W. J. Greedy, St. Lawrence
Star Rover	1807	5	Bay	S. B. Smith, Tor street, Toowoomba
Sterling Slade	1908	5	Black	A. Kubler, Boonah
Studley Laddie	2049	5	Bay	J. Jones, Savannah
Sudden Surprise	1808	5	Brown	L. F. Kuhl, Narko
Talgai Model	1886	5	Bay	J. J. Rynne, Goomburra
The Willow's Trustep	1887	5	Bay	A. M. Cadell, Texas
Toby	1994	6	Bay	T. Clarke, Wietalaba
Trooper Dale	2018	Aged	Bay	W. H. and C. F. Bauer, Watalgan
Ulupna Carl	1809	5	Bay	A. A. Treasure, Brigalow
Viron	1860	5	Bay	H. J. Rasmussen, Kepnock, Bundaberg
Waipa	1991	Aged	Bay	Estate S. L. Roberts, Julatten
Warwick Lad	1992	Aged	Bay	J. P. Guy, Clare, *via* Ayr
Wildash Pride	1861	5	Black	W. J. Borchert, Murgon
William Wallace	1810	5	Bay	M. Lysaght, Bringalily
Willowbank High Degree	1942	5	Black	J. Hamilton, Forest Hill
Willowbank Ronald	1943	5	Bay	R. Stokes, Collingwood, Victoria
Willow Grove Fashion	1909	5	Bay	P. Ryan, Newlands, Gatton
Worthy John	1888	5	Roan	W. A. Deacon, Allora
Young Douglas	1889	5	Bay	E. Costello, Thane
Young George	2050	5	Bay	J. Hall, Wagoora

BLOOD STALLIONS CERTIFICATED FOR THE YEAR 1937–38.

Ankober	1501	3	Chestnut	L. S. Oxley, Wilga, *via* Yelarbon
Archer	1457	4	Brown	L. E. Gossow, Maidenwell
Banker	1458	4	Bay	Elworthy & Mellor, Brooweena
Blue Tie	1459	3	Steel grey	D. Moloney, Chahpingah, Kingaroy
Bon Aero	1455	4	Bay	P. Brennan, Jimboomba
Deer Pride	1547	4	Chestnut	W. Manz, Lowood
Featherdust	1460	4	Brown	J. C. Stockden, Cinnabar
Fernstone	1503	3	Black	Wright and Sons, Kindon, Goondiwindi
Foundation	1548	4	Bay	L. Shine, Fernvale
Fox Vale	1640	3	Brown	A. C. Williams, Homevale, Nebo
Glenveil	1461	4	Bay	A. Guiney, Wondai
Golden Persse	1504	4	Chestnut	C. L. Fraser, Richmond Hill, Pratten
Great Scott	1641	3	Chestnut	F. A. Ross, Waitara, Nebo
Hamleigh	1600	3	Bay	F. Fraser, Hamleigh, Ingham
Home Vale	1642	3	Chestnut	Bell Bros. and Co., Croydon, St. Lawrence
Idol Answer	1462	4	Brown	R. Webb, Beaconsfield, *via* Childers
Klondyke	1588	4	Bay	J. O'Brien, Moggill
Loch Melvin	1589	4	Bay	A. J. Manson, Rockbourne terrace, Paddington
Lord Alwina	1398	4	Bay or brown	W. B. Dent, Glenmona, Warra
Lord Leopolis	1399	4	Brown	Miss N. Pomeroy, Clifford street, Toowoomba
My Paddy	1400	4	Brown	H. A. Clark, Westbrook
Peterborough	1401	4	Chestnut	J. Scotney, Greenmount
Polyveil	1463	4	Chestnut	M. MacDonnell, Coolmore, Gympie
Reklaw	1464	4	Bay	L. C. Walker, Bingera
Revelad	1465	3	Bay	W. E. Sauer, Gayndah
Rexlad	1549	3	Bay	B. Voigt, Glamorganvale, *via* Walloon
Rufus	1644	3	Chestnut	A. D. Shannon, Oxford Downs, Nebo
Sarnyx	1611	4	Iron grey	Camboon Pastoral Co., Camboon
Scholar's Cap	1550	3	Bay	R. Betts, Boonah
Sir Magnum	1551	4	Black	A. Wiegand, Tallegalla
Someday	1466	3	Brown	R. E. Pickels, Coolabunia
Starlight	1467	4	Black	L. J. Mackaway, Goomeri
Sunnie	1468	4	Chestnut	E. N. Sawtell, Coolabunia
Tony	1469	3	Chestnut	W. H. Sawtell, Wooroolin
Warwick Lad	1552	4	Bay	G. A. Heise, Minden
White Flag	1553	4	Chestnut	R. Jackson, Munbilla

PONY STALLIONS CERTIFICATED FOR THE YEAR 1937–38.

Name.	No.	Age.	Colour.	Owner.
Black Prince	1470	3	Brown	A. J. Manning, Byee, *via* Murgon
Bonnie Boy	1507	4	Bay	J. L. Mann, Broadwater, Stanthorpe
Bonny Boy	1471	4	Black	H. Taylor, Gayndah
Bosca	1505	3	Cream	R. A. Howell, Killarney
Cupid	1554	4	Bay	J. Duncan, Stockyard Creek, Helidon
Darbie's Boy	1508	4	Grey	T. Hildred, Gladfield
Darby II.	1509	4	Grey	M. G. Yorston, Coton, Gladfield
Electric Boy	1402	3	Brown	O. Postle, St. Helen's road, Pittsworth
Gold Top	1403	3	Taffy	B. V. Neale, Ramsay, Cambooya
Grey Boy	1472	3	Grey	V. P. Walsh, Runnymede, Nanango
Jimmy Boy	1404	4	Bay	P. T. Dwyer, Maclagan
Lieutenant Jim	1620	4	Bay	W. G. Blomfield, Miriam Vale
Little Jim	1555	3	Bay	J. C. Logan, Gatton
Mac's Choice	1405	3	Chestnut	S. H. Reynolds, Glasgow street, Toowoomba
Pilgrim	1556	4	Grey	D. D. Logan, Pineview, Kilcoy
Playmate	1621	4	Piebald	J. J. Bauer, Watalgan
Prince Carda	1622	3	Brown	C. H. Hammond, Ubobo
Prince Reuben	1406	3	Bay	H. Ruhle, Mount Tyson
School Boy	1623	3	Blue grey	W. T. Brown, Calliope
Silver King	1473	3	Chestnut	E. Litfin, Hivesville
Silver Laddie	1591	4	Grey	H. Cox, Mount Sylvia, Gatton
Spring Meade Bright Fox	1592	4	Black	C. J. Cotter, Hardgrave street, Ipswich
Stibnite	1456	4	Blue roan	J. M. Newman, Caboolture
Theo	1407	3	Creamy	E. G. Lister, Shenstone, *via* Warra
Wee Jim	1510	3	Chestnut	R. A. Newman, Goondiwindi

TROTTER STALLIONS CERTIFICATED FOR THE YEAR 1937–38.

Name.	No.	Age.	Colour.	Owner.
Broad Findon	1474	4	Brown	E. J. Campbell, Kingaroy
Broadwood	1475	3	Bay	A. C. Underwood, Tingoora
Chiming Derby	1590	4	Bay	S. H. Scells, Eveleigh street, Wooloowin
Derby Cole	1511	4	Bay	F. K. Weidman, Clifton
Joker's Echo	1476	4	Bay	T. Renfrey, Degilbo
King David	1557	3	Black	P. Staines, Templin, *via* Boonah
Master Nepean	1408	3	Bay	W. Sullivan, Box 130, Pittsworth

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1937–38.

Name.	No.	Age.	Colour.	Owner.
Abbey Morn	1409	4	Brown	C. H. Frizzell, Southbrook
Adelong	1602	3	Chestnut	C. Jensen, Atherton
Airdale	1477	4	Bay	R. S. McKenzie, Maroondan, Gin Gin
Alan	1624	3	Brown	E. G. Lascelles, Goorganga
Aldouran's Hope	1625	4	Brown	A. A. Brooks, Wundaru, *via* Mackay
Arolla's Heir	1512	3	Bay	D. Ryan, Allora
Balwherri Intent	1478	3	Brown	F. Tucker, Elksmere, Kingaroy
Barney	1644	4	Brown	T. Embrey, Kunioon, Nanango
Baronet II.	1479	3	Bay	G. Wilson, Degilbo
Baron Favourite	1513	3	Bay	P. Fogarty, Headington Hill, Clifton
Baron Model	1410	3	Bay	D. T. Rosenthal, Glenview, Southbrook
Barron Chief	1558	3	Bay	T. M. McGrath, Kincora, Kalbar
Ben Bold	1514	4	Bay	E. Austin, Flemmingdale, Texas
Benefactor	1515	4	Bay	G. McArthur, Maryvale
Berriew Premier	1559	3	Bay	F. D. Arthur, Stockyard Creek, Helidon
Black Boy	1626	3	Black	E. G. Lascelles, Goorganga
Black Intent	1560	4	Black	C. Gnech, Boonah
Black Kerr	1561	4	Black	H. D. Reisenleiter, Mount Sylvia, Gatton
Bob	1443	4	Bay	G. Singh, Canungra
Bold Exchange	1480	3	Brown	H. V. Petersen, Kolan River South
Bold March	1481	4	Bay	L. W. Horne, Takura
Bonnie Charlie	1411	3	Bay	C. H. Barrett, Tara
Bonnie Sheppard	1412	4	Brown	W. Park, Anzac avenue, Toowoomba
Bowler	1603	4	Bay	P. Caspani, Mingela
British King	1516	4	Bay	T. J. Ryan, Clintonvale
Brittany Intent	1604	3	Black	H. B. Orr, Sala Siding
Brown Dale	1627	4	Brown	H. Rowe, Mirani
Bully Bar	1613	3	Bay	V. R. Katte, Kola Bar, Dingo
Canberra Duke	1413	4	Bay	H. A. Koehler, Yamison
Captain	1614	3	Bay	C. T. Johnson, Gracemere
Captain	1517	4	Bay	B. G. Erhart, Goomburra
Caringal Craig Lad	1518	3	Black	W. Evans, Hirstvale road, Greenmount
Carlisle Boy	1519	4	Bay	J. H. McIvor, Emu Vale
Carlyle Boy	1414	5	Bay	W. Redman, Braemar (provisional only)
Christian	1605	3	Bay	Mrs. E. C. Clarke, Maryvale, Charters Towers
Christmas	1606	3	Black	Mrs. E. C. Clarke, Maryvale, Charters Towers
Clinker	1615	3	Bay	J. Moran, Taragoola, Calliope
Clyde	1415	4	Bay	C. Barber, Rywung
Coolana Dignity	1562	3	Bay	J. Lehmann, Coolana
Cowley	1520	4	Bay	E. Cowley, Taxes
Craig Boy	1416	4	Bay	J. and D. Brodie, Nobby
Craig Hero	1417	4	Bay	Derrick Bros., Gaulton, Bell
Craig Son	1418	4	Bay or brown	G. A. Lewis, Canning Creek
Crest Vale Nobility	1521	4	Roan	A. Ritson, Clifton
Crown Prince	1419	3	Bay	J. Allen, Porter's Gap, *via* Bell
Crystal MacBride II.	1420	4	Bay	Mrs. H. R. Kewley, The Gums.

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1937-38—*continued.*

Name.	No.	Age.	Colour.	Owner.
Culverthorpe High Opinion	1483	4	Bay ..	S. B. Trigger, Biggenden
Dark Chief	1421	4	Brown ..	M. Stower, Linthorpe, Pittsworth
Darnley Boy	1522	4	Bay ..	W. R. Penrose, Beebo
Dooling Major Lee ..	1484	4	Bay ..	M. Lobwein, Kybong
Duke	1444	4	Bay ..	G. Low, Pomona
Duke	1422	3	Bay ..	E. Wieck, Maclagan
Duke of Suffolk ..	1563	3	Chestnut ..	Ivy May Arndt, Rosewood
Duke of Windsor ..	1445	3	Bay ..	C. Maas, Waterford
Earl Dale	1564	4	Black ..	E. C. A. Zillmann, Hattonvale
Earl of Windsor ..	1523	3	Black ..	F. Peters, Willowvale
Earl's Pride	1593	4	Bay ..	A. A. Stokes, Collingwood, Victoria
Empston	1565	4	Black ..	T. Zelinski, Lake Clarendon
Eureka Walter ..	1619	4	Silver Roan	C.Q.M.E. Co., Lake's Creek
Extent	1423	3	Black ..	C. O'Sullivan, Greenmount
Fairymead Baron Knight	1524	4	Bay ..	J. P. Warden, Goondiwindi
Fairymead Bold Lorraine	1616	3	Bay ..	H. Dougall, Littlemore
Fairymead Success ..	1628	4	Bay ..	R. Smith, Bowen
Farleton John ..	1610	5	Brown ..	A. P. Nelson, Jesmond, Charters Towers (provisional only)
Farmer	1629	4	Roan ..	A. Welsh, Mia Mia, Mirani
Farmer	1525	4	Bay	C. Erlandson, Allora
Fashion's Prince ..	1526	4	Bay ..	T. J. Brosnan, Killarney
General Kerr ..	1566	4	Bay ..	A. F. Schimke, Summerhill, Laidley
Glasgow Clyde ..	1527	4	Bay ..	G. and F. W. Grimes, Clifton
Glen Dale	1424	4	Bay ..	P. W. Bermingham, Greenmount
Glen Lock	1485	4	Bay ..	C. F. Schmid, Pialba
Glenmore II. ..	1617	3	Black ..	P. Ziebarth, Biloela
Gold Mount Prince ..	1425	4	Brown ..	C. Meskin, Maclagan
Gold Nought ..	1528	4	Chestnut ..	D. Sullivan, Allora
Hero	1486	4	Bay ..	B. T. and L. Balderson, Theebine
Hillview Prince ..	1446	4	Bay ..	E. W. Hill, Hillview
Homedale Honour ..	1638	3	Bay ..	S. McLennan, Red Hill, Nebo
Hurdcott Duke ..	1594	3	Bay ..	R. Stokes, Collingwood, Victoria
Intent's Best	1639	4	Roan ..	A. Shannon, Saltbush Park, St. Lawrence
Jackson	1426	4	Bay ..	D. Kirstenfeldt, Kulpi
Jollie Gloucester ..	1447	3	Bay ..	S. O. Mear, Maleny
Kelso Surprise ..	1487	4	Bay ..	L. C. Walker, Bingera
Kerr Lap	1568	3	Bay ..	H. D. Reisenleiter, Mount Sylvia
Kerrston Carlyle ..	1569	4	Bay ..	J. M. Newman, Caboolture
Kerrston's Delight ..	1570	4	Chestnut ..	W. M. E. P. Prufert, Laidley
Kerrston's Prospect ..	1631	4	Black ..	C. D. Loadsman, Orkabie
Kerrston's Viceroy ..	1488	5	Black ..	W. D. Porter, Kumbia (provisional only)
Kerr Stop	1571	4	Bay ..	H. D. Reisenleiter, Mount Sylvia, Gatton
Kerwein	1572	4	Bay ..	H. Schultz, Morton Vale, *via* Gatton
Kimbar Major ..	1573	3	Bay ..	F. Benbow, Mount Alford
Kimbar Starlight ..	1575	3	Bay ..	D. Vogel, Boonah
King Billy	1448	3	Bay ..	A. O. Bishop, Caboolture
King Dale	1529	5	Bay ..	W. Eastwell, Willowvale (provisional only)
King Hope	1489	4	Brown ..	H. Powell, Kumbia
King Pin	1490	4	Bay ..	R. B. Jefferies, Nanango
Leed's Grove Slade Alba	1491	3	Bay ..	Fairymead Sugar Co., Bundaberg
Lehmanni Tenor ..	1427	4	Black ..	Mrs. R. V. Breydon, Brooklyn, Haden
Lion	1428	3	Bay ..	H. Simmons, St. Martin's, Yandilla
Logan Prince ..	1449	4	Bay ..	W. W. Bell, Rathdowney
Lord Eacham ..	1607	4	Bay ..	Winfield Bros., Yungaburra
Lord Kerrston ..	1429	4	Black ..	R. Anderson, Southbrook
Loyal Carlisle ..	1530	3	Black ..	W. Doro, Pozieres
Mailboy's Heir ..	1450	4	Bay ..	R. H. F. Graham, Tabragalba
Major	1492	4	Bay ..	C. A. Taylor, Brooloo
Major	1493	4	Brown ..	T. Turner, Mannuem road, Kingaroy
Major Wallace ..	1575	3	Bay ..	B. Czislowski, Lilydale, Helidon
Marble Intent ..	1632	3	Iron grey ..	T. Comerford, Finch Hatton
Marshall Gaiety ..	1576	4	Bay ..	C. A. Martens, Marburg
Marshall Ney ..	1633	4	Roan ..	M. R. Shannon, Olive Downs, Nebo
Martin Dale	1430	3	Bay ..	J. H. L. Van Pein Quibet, Pittsworth
Master Dale	1577	4	Bay ..	H. O. Neumann, Plainland
Maxwell ..	1578	3	Bay ..	M. W. Kruger, Mutdapilly
Napuna Lad ..	1531	3	Brown ..	P. Fogarty, Headington Hill, Clifton
Ngapuna	1595	3	Brown ..	T. Robson, Crow's Nest, Sydney
Nigger	1431	4	Black ..	C. Dunemann, Murra Murra
Noble	1532	3	Bay ..	M. McMahon, Warwick
Noble Intent ..	1634	4	Bay ..	A. F. Clausen, Homebush road, Mackay
Noble King	1533	3	Bay ..	D. C. O'Leary, King's Creek
Oak Branch	1482	4	Bay ..	A. A. Dent, Gayndah
Oxford Don	1494	3	Brown ..	S. J. C. Jenkins, Miva
Plainview Intent ..	1534	3	Bay ..	A. S. Freer, Clifton
Poplar	1635	3	Blue Grey ..	E. Collins, Tondara, Gumlu
Pride	1432	4	Bay ..	S. E. O'Brien, Jandowae (provisional only)
Prince	1433	4	Bay ..	N. Thornton, Rocky Creek
Prince	1535	4	Bay ..	S. G. Bremner, Yelarbon
Prince	1495	3	Black ..	J. Regan, Coolabunia
Prince Charlie ..	1536	4	Bay ..	Gross Bros., Campbell's Plains
Prince Rocket ..	1496	4	Bay ..	Stewart and McCauley, Mundubbera

DRAUGHT STALLIONS CERTIFICATED FOR THE YEAR 1937–38—*continued.*

Name.	No.	Age.	Colour.	Owner.
Prince Wallace	1579	3	Bay	W. Profke, Glamorganvale
Red Robin	1537	3	Bay	W. A. Deacon, Allora
Rich Lad	1497	3	Bay	H. Welsh, Proston
Robin Dale	1451	4	Bay	H. Wynne, Jimboomba
Rob Roy	1434	4	Black	A. H. Gierke, Chinchilla
Rocket	1538	4	Bay	A. W. Naumann, Mount Kent, Nobby
Ron	1498	4	Bay	D. C. Myles, Mungungo
Rosefarm Bold Kerrston	1580	4	Bay	J. W. Evans, Boonah
Rosefarm Kerrston's Pride	1499	3	Bay	E. L. Dent, Reid's Creek, Gayndah
Royal Dale	1435	4	Black	I. N. Kahler, Geham
Royal Intent	1539	4	Bay	H. J. Pacholke, Five Ways, Clifton
Royal Kerr	1618	4	Bay	F. R. Lehmann, Biloela
Royal Kerrston	1581	3	Bay	H. Heisner, Blenheim, Laidley
Royal Scot	1582	4	Bay	J. L. Strack, Mount Whitestone
Royal Sheppard	1436	3	Bay	S. T. Evans, Chinchilla
Scottish King	1437	4	Bay	G. Telford, Nobby
Sergeant Bruce of Greyhurst	1438	3	Bay	A. J. P. Kruger, Goombungee
Shepherd Hill Major Robin	1596	4	Bay	J. H. Kelvington, Glenore Grove
Shepherd Hill Sandy Kerlin	1597	4	Brown	J. H. Kelvington, Glenore Grove
Shepherd's Pride	1439	4	Brown	H. A. Nauschutz, Canaga, Jandowae
Sherlock	1583	4	Bay	G. A. Wieland, Allendale, Boonah
Sir Nolan	1452	4	Bay	J. L. Everdell, Veresdale
Squaredale's Pride	1540	3	Bay	B. Hoffmann, Emu Vale
Square William	1541	3	Bay	G. H. Rettke, Emu Vale
St. Helen's Dalkirk	1500	4	Bay	R. G. Allen, Wolca
Sydler	1636	4	Bay	J. Dalton, Pleystowe
Talgai Duke	1440	3	Bay	J. D. Learmonth, Hill View, Pittsworth
Talgai Gaiety	1542	3	Bay	H. Sprott, Ellinthorp
Talgai Hero	1441	4	Black	W. Freyling, Hogdson Vale
Talgai Robin	1598	3	Bay	H. Sprott, Ellinthorp
Talgai Warrior	1543	3	Bay	H. Sprott, Ellinthorp
Tarzan	1584	4	Bay	Roderick Estate, Wilson's Plains
Tenthill Victory	1585	3	Bay	W. H. Grams, Upper Tent Hill
Tiger Boy	1544	3	Black	A. F. Barlow, Five Ways, Clifton
Tom	1453	4	Bay	R. and S. Lahrs, Norwell
Trooper	1545	4	Bay	R. and L. Ole, Yarranlea
True Blue	1454	4	Grey	B. T. Smiles, Hillview
Ulupna Glade	1608	4	Grey	W. C. Storer, Upper Barron, Atherton
Wee Glen	1586	3	Bay	J. Baulch, Mulgowie
Werndew Depression	1599	3	Bay	A. A. Stokes, Collingwood, Victoria
Willow Banks Footprints	1637	3	Brown	N. McLennan, Gargett, Mackay
Wolsingham Gold Miner	1609	4	Bay	M. Murnane, Atherton
Young Intent	1546	3	Bay	P. G. Freer, Clifton
Young Kerrston	1587	4	Bay	B. O'Connor, Grantham
Young Ngpuna	1442	4	Bay	A. J. Harris, Yarranlea

REJECTED STALLIONS.

List of Stallions in respect of which Certificates of Registration were refused, on account of either lack of type and/or conformation, lack of size, or unsoundness during the year 1937-38. These horses are prohibited from use for stud purposes, either public or private:—

BLOOD STALLIONS REJECTED DURING YEAR 1937–38.

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Abbadear	6	Grey	L. T. and C.	M. F. Postich, Warra
Archie Spear	4	Brown	Curb	S. G. Borchert, Rosevale
Bilola	3	Brown	L.T.	E. Wason, Goomeri
Dick	Aged	Chestnut	Spavin	A. McDowall, Yeppoon
Fishhawk	4	Brown	Spavin	T. F. Dallon, Nankin Junction
Hadagen	3	Bay	L.T. and C.	C. J. McWilliam, Leyburn
Lear	6	Brown	L.T. and C.	J. Waldron, Boggabilla
Lone Hand	3	Chestnut	L.T.	C. B. Treloar, Gympie
Marksman	5	Bay	Bog Spavin	A. Marxsen, Ubobo

BLOOD STALLIONS REJECTED DURING YEAR 1937–38—*continued.*

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Master Nickleby ..	4	Brown ..	Spavin and Nasal Dis.	G. Grey, Yeppoon
Muscatel	4	Bay ..	L.T. and Con.	P. E. Logan, Upper Tent Hill
Music	Aged	Chestnut ..	Unicrypt and L.T. and C.	R. Alford, Ravenswood
Mutiara	6	Bay ..	Roarer ..	A. W. Jarvis, Eidsvold
Paddy	4	Brown ..	L.T. and Con.	D. Stark, Anduramba
Pasha Boy	5	Grey ..	L.C.	S. Offord, Bajool
Ribbon Lad	5	Bay ..	L.T. and Con.	F. M. Toppenberg, Mount Morgan
Sunny Boy	3	Chestnut ..	L.T. ..	T. Burke, Kandanga
Tony	4	Brown ..	L.T. and Con.	Kerr Bros., Warra
..	6	Bay ..	L.C. ..	W. M. Coles, Gladstone
..	7	Piebald ..	L.T. and Con.	A. Fraser, Ingham
..	3	Brown ..	L.T. and Con.	J. Barker, Oak Hills, Ingham

PONY STALLIONS REJECTED DURING YEAR 1937–38.

Gay Lad	Aged	Black or brown	L.T. and Con.	H. E. Weare, Upper Barron, Atherton
Jacko	4	Bay ..	Curb ..	N. T. Wright, Goondiwindi
Lord Jim	3	Piebald ..	L.T. ..	J. Hayden, Kingaroy
Night Wind	4	Bay ..	L.T. and Con.	D. Lewis, Carinya, Maclagan
Patlight	4	Piebald ..	Uni-crypt ..	W. Wilkin, Coal Plains
Sir William	3	Bay ..	L.T. and Con.	G. Byers and T. Barton, Plainby
Trinket	Aged	Grey ..	Uni-crypt ..	F. Neil, Yeppoon

DRAUGHT STALLIONS REJECTED DURING YEAR 1937–38.

Adam	5	Bay ..	Sidebone ..	T. McGrath, Moombra, Coominya
Admiral Wallace ..	4	Brown ..	L.T. and Con.	W. A. Trott, Pittsworth
Argyll Mafeking ..	5	Grey ..	Sidebone ..	T. Noble and Sons, 656 Route, Mackay
Back Plains Silverdale	5	Bay ..	Sidebone ..	C. E. Lack, Back Plains
Black Prince	4	Black ..	L.T. ..	L. C. Walker, Bingera
Blutcher	3	Brown ..	Sidebone ..	J. H. Bryant, Charters Towers
Boxer	6	Brown ..	L.T. ..	H. L. Harris, Mungungo
Bright	Aged	Bay ..	L.T. and Con.	A. L. Ramsay, Mount Fox, Ingham
Brooklyn Keynotes Dignity	6	Bay ..	Sidebone ..	W. Backhouse, Killarney
Captain	5	Bay ..	L.T. ..	A. O. Andreassen, Tuchekoi
Charley	4	Black ..	L.T. and Con.	T. J. and M. J. Dwan, Bony Mountain, Cunningham
Chrystal Blaze ..	3	Bay ..	L.T. and Con.	E. Cooper, Pratten
Colonel	4	Chestnut ..	L.T. and Con.	W. Johnson, Malanda
Crystal Stripe ..	6	Bay ..	L.T. and Con.	V. Jankhe, Rywung
Damsel's Lad ..	5	Bay ..	Sidebone ..	W. C. Miller, Woodford
David	Aged	Bay ..	L.T. and Con.	D. N. Perry, Milmerran
Davy	3	Bay ..	L.T. and Con.	T. W. Luck, Southbrook
Don	Aged	Brown ..	Sidebone and L.T. and C.	J. Tate, Tolga
Drummer	Aged	Bay ..	L.T. and Con.	E. G. Webb, Pittsworth
Duke	4	Black ..	Sidebone ..	A. Murphy, Alderney, Mount Larcom
Duke	5	Bay ..	L.T. ..	F. W. Chippendall, Kandanga
Farmer's Boy ..	3	Bay ..	L.T. and Con.	W. A. Deacon, Allora
General	4	Bay ..	L.T. ..	A. E. Traves, Woolooga
Glen Allen	5	Bay ..	L.T. ..	E. E. Kerle, Wondai
Glen II.	5	Bay ..	L.T. and Con.	J. Tennyson, Chinchilla
Jim Donald	Aged	Bay ..	L.T. ..	J. Macfarlane, Woolooga
Kerr Son	4	Black ..	L.T. and Con.	N. D. Dallinger, Mount Sylvia, Gatton
Kerrston Again ..	6	Brown ..	Sidebone ..	M. R. S. McLaughlin, Bracewell
King George ..	5	Bay ..	Sidebone ..	L. Hogarth, Stonehenge
Kingsford	4	Brown ..	L.T. ..	D. J. Cavanagh, Tarong
Knight	5	Black ..	L.T. and Con.	A. O. Raddatz, Ingoldsby, Gatton
Knight Abbit ..	Aged	Brown ..	Sidebone ..	W. R. Buchholz, Sharon, Bingera
Mac's Pride	5	Brown ..	L.T. and Con.	L. McGrath, Oakey
Major	5	Bay ..	L.T. and Con.	P. O'Shea, Monmouth, Chinchilla
Major	5	Brown ..	L.T. and Con.	P. W. G. Wirth, Square Top
Marshall	3	Brown ..	Sidebone ..	E. J. G. Thormahlen, Bowen
Max	5	Bay ..	Sidebone ..	S. B. Anderson, Wondai
Mystery	4	Bay ..	L.T. and Con.	A. O'Toole, Milmerran
Ned	Aged	Roan ..	L.T. and Con.	J. A. Holland, Yuruga
Ned	Aged	Brown ..	L.T. ..	G. Philip, Pine Creek
Noble	4	Black ..	Bog spavin and Thoropin	F. Lawrence, Blackbutt
Noble	Aged	Bay ..	L.T. ..	R. Newitt, Pine Creek
Noble Lad	Aged	Roan ..	Sidebone ..	St. Ronan's Pastoral Co., Gordonvale
Perfect Dale	Aged	Bay ..	L.T. and Con.	B. Castles, Punche's Creek, Rocky Creek
Pilot	5	Bay ..	L.T. ..	P. W. Ross, Goodwood
Prince	5	Brown ..	L.T. and Con.	M. J. MacGinley, Greenmount
Prince	6	Bay ..	Sidebone and L.T. and C.	L. Favier and Sons, Kairi
Prince	Aged	Grey ..	Sidebone ..	S. G. Crocker, Wagoora
Prince	Aged	Bay ..	L.T. ..	C. J. Jansen, South Kolan
Punch	4	Bay ..	Sidebone ..	D. J. Kelly, Bororen

Draught Stallions Rejected during Year 1937–38—*continued.*

Name.	Age.	Colour.	Reason for Rejection.	Owner.
Punch	5	Bay ..	L.T. ..	N. J. D'Arcy, Goomeri
Punch	4	Bay ..	L.T. and Con.	J. Ost, Upper Tent Hill
Royal Prince II. ..	4	Brown ..	Sidebone ..	G. V. Hess, Kaimkillenbun
Sailor	3	Bay ..	L.T. and Con.	R. Graham, Minbun
Scotch Lad	3	Bay ..	L.T. and Con.	A. Varley, Tarzali
Sonny Boy	5	Bay ..	Sidebone ..	S. A. Barrett, Drumberle
Studleigh Premier Lad II.	4	Bay ..	L.T. and Con.	Mrs. E. I. Walker, Greenmount
Toby	6	Roan ..	L.T. ..	E. Heathcote, Eel Creek, Gympie
Wallace	5	Brown ..	Sidebone ..	W. H. Lamke, Gundiah
Young Leonard ..	5	Brown ..	L.T. ..	V. Barsby, Graham's Creek
..	Aged	Black ..	L.T. and Con.	Estate H. E. Garthe, Cross Hill, Oakey
..	4	Black ..	L.T. and Con.	A. Hollman, Kaira
..	Aged	Bay ..	L.T. and Con.	T. Clements, McDesme, Ayr

FOR FENCING IN SWAMP LAND.

Take a piece of timber which two men can lift comfortably—preferably a piece of hardwood from 2 feet 6 inches to 3 inches long. Now secure four arms 3 feet long and about 2 inches thick shaped at one end to fit holes which are bored in this block. Bore two holes on opposite sides, about a third of the distance from the

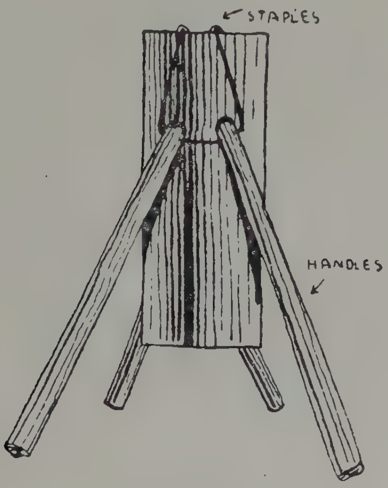


Plate 73.

top, and 4 inches apart. Place them at such an angle that the ends of the arms, when fitted, are about 2 feet apart and 18 inches from the block. Then wire securely as shown in the diagram. This device is very effective when fencing through swampy ground or where it is too wet and soft to dig a post-hole.—S.F.M in "The Primary Producer" (W. Aus.).

Preparing the Strawberry Plot.

W. G. HANCOCK, Inspector, Diseases in Plants Acts.

LAND for strawberries should be prepared long before the time of planting out the rooted runners.

The strawberry does best on a friable soil supplied abundantly with organic matter, of which most soils require a heavy addition if the strawberry is to grow at its best. Strawberries also require plenty of moisture. The surface of the soil should be kept as cool as possible. A high organic content helps to supply these requirements.

The photograph illustrates two plots planted last season. On the left of the spray pipe line a heavy application of dung was ploughed in; on the right no dung was given. The land was good average red-brown loam, and, apart from the dung, each plot received identically similar soil preparation, irrigation, and top-dressing. The superiority of the young plants on the left is evident; they are bigger, of better colour, and there are no misses.

The photograph was taken in early June, before flowering. The crop from the dunged plot was by weight over four times that of the unmanured plot, and the berries averaged a much higher grade.

The moral is that often it is more profitable to work a smaller area intensively than to spread one's efforts over a larger area worked not so thoroughly.

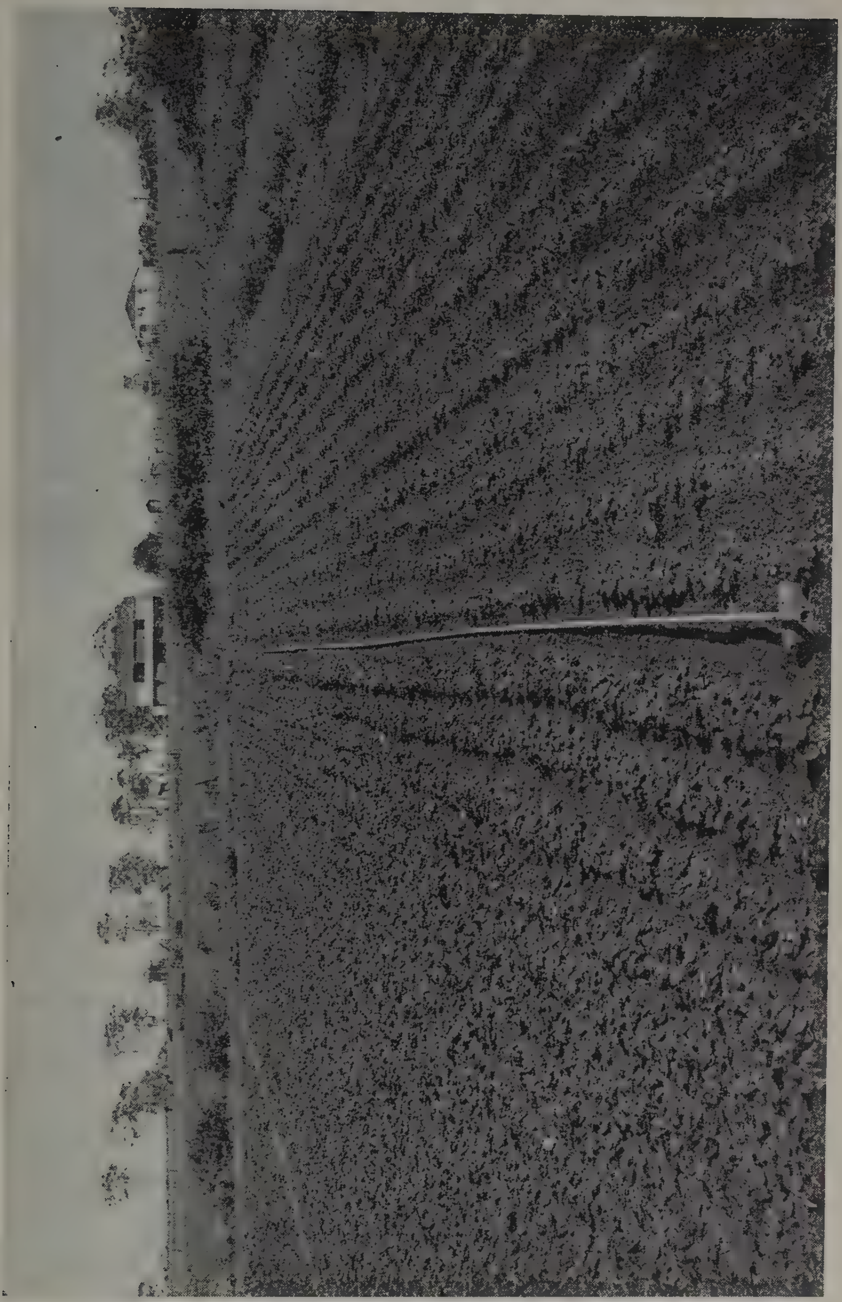


Plate 74.

THE EFFECT OF ORGANIC MANURING.—A strawberry plot comparison.

The Leaf-eating Ladybird.

J. HAROLD SMITH, M.Sc., Senior Research Officer.

MOST ladybird beetles are useful insects which prey on aphids and other similar pests. The leaf-eating ladybird, however, possesses quite different habits, and many farmers familiar with typical insects in the group fail to appreciate the fact that some species are definitely harmful to cultivated crops.

The leaf-eating ladybird is a very common pest of potatoes and it also attacks most cucurbitaceous plants, such as the pumpkin and the melon. Spring and early summer crops suffer most severely, and even though the plants may not be completely destroyed, the leaf destruction attributable to the pest can seriously curtail the total yield.

Both adults and larvæ attack the foliage. The beetles eat holes into the leaves, feeding from both the upper and lower surfaces, but the larvæ are only found on the under surface, where they erode a characteristic network between the main veins, though the upper surface layer of cells is left intact. As a result of an attack, the plants acquire a distorted, ragged appearance, which not only looks unsightly, but more or less accurately reflects the potential reduction in the crop yield.

The beetle is a typical ladybird, about ¼ inch in length and rounded in shape. The ground colour is yellow, but a large number of black spots scattered over the hard outer wings and thorax give the insect a characteristic appearance. Yellowish, elongate oval eggs are deposited on the leaves in clusters with the pointed ends uppermost. From these the larvæ hatch and commence to feed. The full-grown larva is somewhat longer than the beetle and yellow in colour, but the upper surface bears several rows of many-branched dark-coloured spines. Pupation takes place on the underside of the leaf, on the leaf stalk or on the main stem of the plant; the pupa invariably retains the cast larval skin at the posterior end of the body.

The whole life cycle is completed in about four weeks, but the generations overlap a great deal, and adults, larvæ, pupæ, and eggs are commonly found together on the one plant.

Outbreaks of this pest are usually sporadic, but if uncontrolled, serious losses may occur. The use of lead arsenate applied as a spray at a strength of 1½ lb. in 50 gallons of water, or as a dust either diluted with a suitable carrier or undiluted is effective. Though this insecticide can be freely applied to crops such as potatoes, care must be used on plants such as the pumpkin which bear exposed edible fruit, otherwise injurious deposits of the poison may accumulate on the fruit. Control measures should therefore be applied when the plants are young before the insect reaches pest proportions. In such crops, arsenicals cannot be safely applied to the crop late in the growing period, but some relief can be obtained by the liberal use of wood ashes or a similar inert dust which acts as a deterrent to the pest.

The Fruit Market.

JAS. H. GREGORY, Instructor in Packing.

AS the holiday season occurs during the peak of production of stone fruits, a marketing problem is presented that will require quite a lot of thought before a satisfactory solution will be found. A noticeable feature of the trade during the annual vacation period was the high prices prevailing for fruit at the holiday resorts. At one important seaside centre peaches could not be obtained for less than eight for 1s. during the whole of the time in which peaches, through oversupply, were practically unsaleable on the market. This is another marketing question awaiting solution.

Bananas show no signs of improving in value. No substantial increase in price can be looked to until the most of the deciduous fruits have disappeared from the market. It is unfortunate that holidays, hot weather, and competition from deciduous fruits should all come at the same time.

New season apples are now in full supply. Unfortunately, old season fruit was held in cold storage too long. While causing loss to growers, this fruit has had a detrimental effect on prices of new apples. Market values at the end of January were:—

TROPICAL FRUITS.

Bananas (Cavendish).

Brisbane.—Nines, 6s. to 10s. tropical case; eights, 4s. to 10s.; sevens, 4s. to 9s.; sixes, 4s. to 7s. 6d.; smalls, 4s. to 5s.

Sydney.—Nines and eights, 13s. to 16s. tropical case; sevens, 10s. to 13s.; sixes, 8s. to 10s. Inferior bananas hard of sale.

Melbourne.—Nines and eights, 12s. to 13s. tropical case; sevens, 10s. to 11s.; sixes, 8s. to 9s.

Pineapples (Smoothleaf).

Brisbane.—4s. to 6s. per case, 1s. 6d. to 3s. 6d. per dozen. Ripleys, 3s. 6d. to 5s. 6d. per case, 9d. to 3s. 6d. per dozen.

Sydney.—6s. to 9s. per case. Heavy stocks of pines are obtainable. Prices are not likely to increase.

Melbourne.—7s. to 9s. per case. Water blister still prevalent.

Papaws.

Brisbane.—Locals, 2s. to 4s. per case, special brands higher; Gunalda, 5s. to 7s. per bushel case.

Sydney.—8s. to 14s. Special quality higher.

Melbourne.—10s. to 14s. per case.

Mangoes.

Brisbane.—Special varieties, 4s. to 6s. per bushel; Locals, 1s. to 3s. per bushel.

Sydney.—8s. to 10s. for selected lines.

Melbourne.—Selected types to 12s. per bushel.

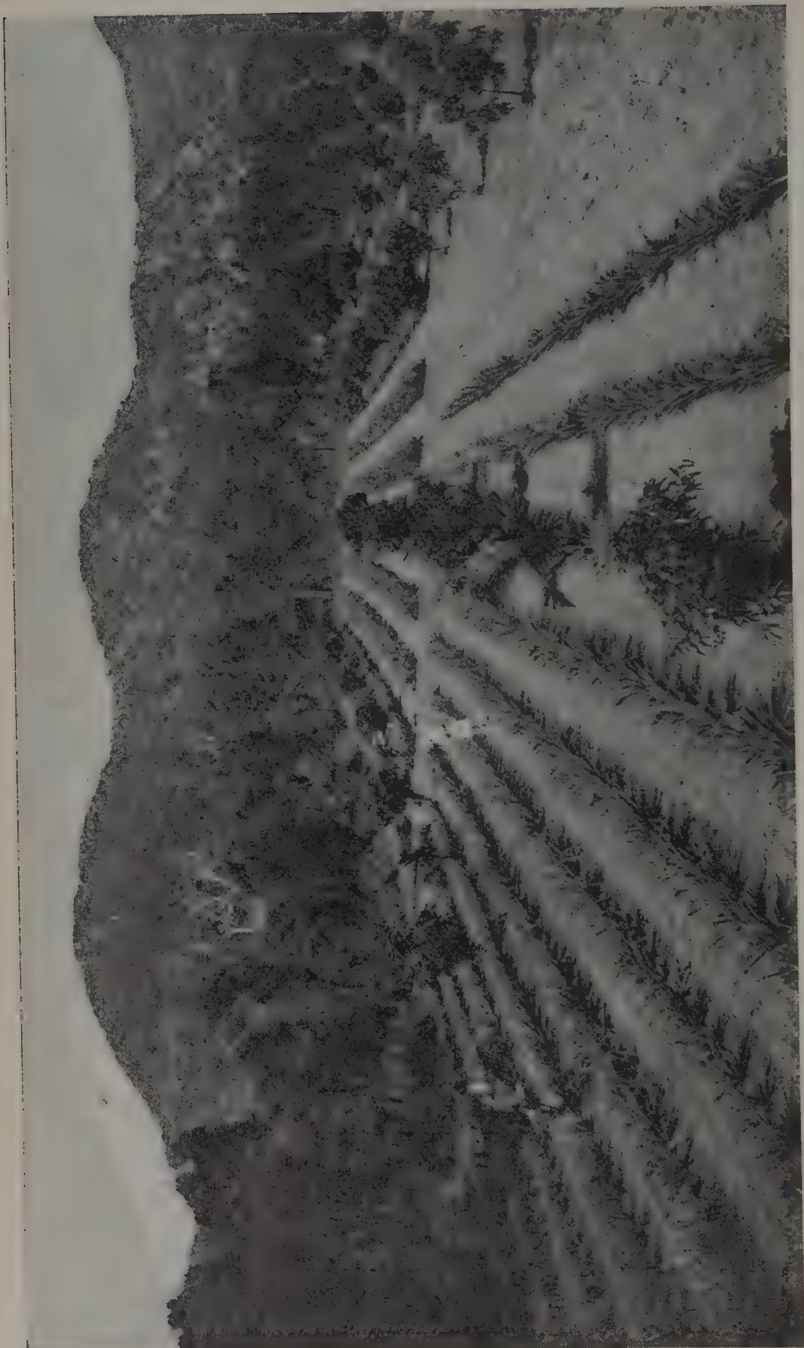


Plate 75.

A PLANTATION ON MAGNETIC ISLAND, NORTH QUEENSLAND.—Avenues of young coconut palms and mangoes, with rows of smooth-leaf pineapple plants between, make a strikingly beautiful picture in this "pocket" on Magnetic Island—the property of Mr. Geo. Lloyd-Apjohn.

Monstera Deliciosa.

Some small consignments have been sent to Melbourne, realising 6s. to 8s. per small case.

Passion Fruit.

Brisbane.—5s. to 6s. per half bushel; seconds, 1s. per case less.

Sydney.—2s. to 5s. per half bushel.

Melbourne.—5s. to 8s. per half bushel.

CITRUS FRUITS.

Lemons.

Brisbane.—Gayndah, 14s. to 18s. per bushel case; Specials, to 20s.; Local, 9s. to 14s. per bushel case.

Sydney.—2s. to 7s. per bushel.

Oranges.

Brisbane.—New South Wales Valencias, 10s. to 14s.; inferior to 7s.

Sydney.—2s. to 9s. per bushel

Grape Fruit.

Brisbane.—Consignments of American and Palestine Grape Fruit have been received and handled at fair prices.

Sydney.—5s. to 10s. per bushel.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Stanthorpe Gravenstein, 8s. to 12s.; inferior, 4s. to 5s. Small sizes hard to sell. Dunns, 3s. to 5s.; Scarlets, 5s. to 8s.

Sydney.—Gravenstein, 3s. to 10s.; MacIntosh Red, 6s. to 10s.; Dunns, 5s. to 7s.

Pears.

Brisbane.—Williams, 4s. to 7s.; Clapps, 4s. to 6s.

Quinces.

Brisbane.—5s. to 6s. per bushel case.

STONE FRUITS.

Brisbane.—Peaches, 1s. 6d. to 3s. per half bushel. Nectarines, 3s. to 5s. per half bushel. Many lines affected with Brown Rot. Plums—Doris, 2s. 6d. to 6s. per half bushel; Narrabun, 2s. 6d. to 6s. per half bushel; October Purple, 3s. to 5s. per half bushel.

Grapes.

Brisbane.—Stanthorpe Chouch, 5s. to 6s. per half-bushel; Muscats, 7s. to 9s. per half-bushel; Roma Muscats, 5s. to 7s. per half-bushel; Purple Conneton, 5s. to 8s.

OTHER FRUITS.

Figs.

Brisbane.—1s. 6d to 2s per tray, 4s. to 6s. per dozen boxes.

Tomatoes.

Brisbane.—Local—ripe, 2s. to 4s. per half bushel; green, 1s. to 2s. per half bushel. Stanthorpe—ripe, 2s. to 4s. 6d. per half bushel; green, 1s. 6d. to 3s. per half bushel.

VEGETABLES.

Brisbane.—Peas, 9s. to 12s. sugar bag. Beans, 7s. to 10s. sugar bag; poor lines less. Lettuce, 9d. to 2s. per dozen. Cucumbers, 3s. to 4s. bushel case.

WASHING OF SOIL IN ORCHARDS.

Surface drainage should be studied before laying out an orchard. In established orchards where it is found that surface wash and scouring is occurring, much can be done to prevent it. All surface water from above the orchard may be diverted by making a wide, shallow contour drain on the top side of the orchard, where the ground may be grassed. With a plough and scoop, this drain can be made usually at a very small cost. Depth and width will be determined by the volume of water to be diverted, but a drain about 4 feet wide and 18 inches deep, with the soil scooped on to the lower side, will do in most cases. This type of drain will not scour nor silt up readily, and if well grassed will need very little attention.

It should be remembered that a fall of 18 inches in every 100 feet is the correct grade for surface contour drains in a cultivated area.

To reduce loss of soil by the action of heavy rains on the cultivated area, the planting of suitable cover crops should receive attention.

If it is not intended or desired to plant cover crops, it should be remembered that badly cultivated land with a hard pan near the surface will wash more severely than if good cultivation has been the rule.

Where the ploughing has been left in the rough it will be found that each furrow will carry its own water, whereas a final cross-ploughing tends to back the water up until it forcibly breaks through at a low point, generally causing a big run and considerable damage.

—*A. M. Richardson.*

PROPPING BANANAS.

Loss of promising and superior fruit as the result of uprooting and breaking down caused during the recent cyclonic weather in the Mons Marie variety shows the necessity for a system of propping that will reduce loss to an absolute minimum.

The method giving the best results is double propping, and it is carried out as follows:—Two stakes, 2 inches by 2 inches and approximately 12 feet long, are tied together about 1 foot from the end, and the tie wire left about 2 feet in length.

The two stakes are opened and the small fork or crotch formed by the union of the two stakes is placed at the correct height on the plant, and the length of wire is drawn round the stem and joined on the props.

When the two legs are firmly placed, and with the aid of the wire tie, it will be apparent that the plant will withstand a great amount of buffeting from the weather.

It is wise to place the props in position as soon as the plants have bunched, as it is noted that at this stage quite a large number are affected.

Another advantage of this method is that the bunch hangs between the two props, thus practically eliminating damage through rubbing.

For Cavendish bananas this method is just as practical, as the one-stake system causes an appreciable loss through rubbing, but for this variety the length may be reduced to 9 feet.

—*J. H. Mitchell.*

VALUE OF BIRD LIFE TO THE ORCHARDIST.

The economic value of bird life is not generally realised, and often little appreciated by orchardists, who may adopt an indifferent or careless attitude towards its preservation.

It has been said that about 5 per cent. of the birds known to the fruitgrower as common visitants to his orchard are destructive in some way; but even these may be among the useful species, being insectivorous as well as fruit-eating. Some birds, while being more or less destructive during the fruit season, may do useful work in pest control the whole year round.

Because of their insectivorous habit, birds are Nature's agents in preserving balance by keeping insect pests from attaining plague proportions. Every orchardist should, therefore, assist in their protection, prevent as far as possible their indiscrimate slaughter for food or "sport," and preserve, where practicable, their breeding grounds.

—*A. M. Richardson.*

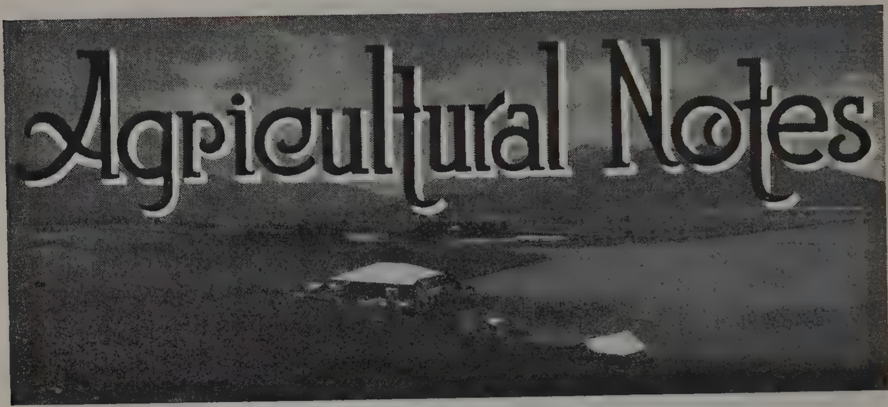
TO SUBSCRIBERS.

Subscribers to the Journal are asked to write their names legibly on their order forms. The best way is to print your surname and full christian names in block letters, so that there shall be no possibility of mistake.

When names are not written plainly it involves much tedious labour and loss of valuable time in checking electoral rolls, directories, and other references. This should be quite unnecessary.

Some subscribers write their surname only, and this lack of thought leads often to confusion, especially when there are other subscribers of the same surname in the same district.

Everything possible is done to ensure delivery of the Journal, and subscribers would help us greatly by observing the simple rule suggested, and thus reduce the risk of error in names and postal addresses to a minimum.



Cotton Cultivation.

THE cotton crops generally were showing the effect of the droughty conditions that had existed in most areas since the middle of December until the recent rains relieved the position considerably.

Cotton growers are fully aware that further periods of dry and hot weather are probable throughout February and until about the middle of March. They are therefore reminded of the necessity of thorough cultivation for the control of weeds, and particularly for the conservation of moisture.

The maintenance of clean cultivation in the cotton fields not only assists in the proper development of the plants, but also helps to prevent attacks from insect pests such as the corn ear worm. The moth of this insect sometimes makes a heavy laying of eggs on growths such as pigweed, so that clean cultivation should be maintained for as long as possible. It is suggested that the best work can be done with a two-row cultivator of the type which the driver steers with his feet the carriage on which the tynes are fastened, rather than depending entirely on guiding the horses. There are several makes of this type, all of which can be equipped with tyne-sweeps and duck feet. By using such a machine, not only can better work be done, but a greater acreage can be cultivated in a day.

Cultural methods used at the Cotton Research Station, Biloela, indicate that it is advisable to continue the cultivation between the rows until late in the season. For this purpose a one-horse scuffler equipped with long traces and a short spreader behind the horse is used. Hessian is wrapped around the ends of the spreader so as to prevent damage to the branches. This cultivation helps in checking weed growth in the middle of the rows and in maintaining a moisture retaining mulch during the period when the top crop of bolls is developing. It is believed that this extra cultivation, especially in dry times, assists in the development of these bolls and allows of a better class of cotton being produced in that portion of the crop.

Cotton growers are strongly advised to cultivate as soon as possible after the fall of further rains, so as to maintain a clean cultivation and form a surface mulch that will reduce moisture evaporation to a minimum.

—*R. W. Peters.*

Lupins for a Winter Cover Crop.

N. J. KING.*

MANY canegrowers practise spring planting in South Queensland and thus have a fallow period from the time of harvesting until August or September of the following year. The usual practice is to grow a Poona pea crop in the summer, and then leave the land in bare fallow

Plate 76.
Crop of winter grown New Zealand Blue Lupin, Bundaberg Station.

until required for planting. Several growers have attempted to grow a winter crop of field peas as well as the Poona pea crop, but the poor weight of material obtained has been disappointing. The Manager of Windermere Plantation (Mr. C. Colquhoun) this year planted some blocks with the New Zealand Blue Lupin in an endeavour to find a suitable winter crop. So far as is known this is the first planting of this seed on Queensland cane country. A trial planting was also made at the Bundaberg Experiment Station. The success of the crop has now been proved, and for those who prefer a second green crop to a bare fallow there is little doubt that the lupins will be successful. The illustration is from the block on the Experiment Station. The photograph was taken in the heaviest corner of the block, and a section was cut down here prior to turning under to obtain the weight of green material. This amounted to nineteen and one quarter tons per acre. The crop was ploughed under when in flower. It is a very succulent crop, easy to plough, and is in no way fibrous. The disc cuts through it easily. Owing to its succulence it will probably rot quickly. It should be mentioned that as the seed was planted in early June when the land was very dry the sprays were put on the block for a germination. Another spraying was given when the crop was about nine inches high.

* In the "Cane Growers' Quarterly Bulletin" for October (Bureau of Sugar Experiment Stations).

A reasonable argument against the growing of a winter green crop is that should a dry spring be experienced there will be no moisture left in the soil after the crop has rotted. Planting would then have to be postponed. This note on lupins, however, is not a recommendation to grow winter crops, but a suggestion of crop worth trying for those farmers who favour this method of agriculture.

We have had no experience of the value of the blue lupin as a fodder crop in Queensland, but a strain of this plant is now being grown extensively as a fodder crop in Western Australia. It has proved itself particularly well adapted to light sandy soils under the conditions of winter rainfall obtaining in that State. It has proved particularly suitable for sheep grazing; the sheep will eat the young plants but will not eat the further growth until the seed is ripe, when they eat the seeds with relish.

SEEDS OF NATIVE GRASSES.

WITHIN the past year a considerable amount of interest has been shown both by pastoralists and by dairymen in the sowing-down of pastures of drought-resistant native grasses. Many of the graziers who have sought information concerning the availability of native grass seeds have desired to utilise the seed for the artificial reseeding of natural pastures which have been thinned out by drought. Numerous other sheep and cattle raisers have been eager to sow down on their own properties drought-resistant native grasses from other parts of the State. The heavy losses sustained in many dairying districts during the recent drought stimulated a desire in many dairy farmers to test out the most renowned of the native pasture grasses under their local conditions.

The grasses in most demand for the purposes outlined above are the Mitchell grasses. There are four distinct types of Mitchell grasses (Curly Mitchell, Hoop Mitchell, Barley Mitchell, and Bull Mitchell), and of these, perhaps, the best one for general purposes is the Curly Mitchell.

Seed of Curly Mitchell is now being collected in large quantities for commercial purposes, and the current retail price is between 2s. 6d. and 3s. 6d. per lb. Since the seed is very light and generally of fair germinating capacity, this price is considered to be reasonable. If sown broadcast about 4 lb. an acre should suffice to give a good stand; and this quantity may be reduced by half if the seed is sown in drills with a combine.

In some circumstances one or more of the other three types of Mitchell grasses are to be preferred to the Curly Mitchell, but so far as can be ascertained no seeds of these types are yet available.

While the purchaser of Mitchell grass seed has at present little choice in the matter of the origin of the seed (practically all of the seed being harvested in northern New South Wales), he should bear in mind that seed collected in his own district or in a district with similar climatic conditions is likely to be better for local sowing than seed from other sources.

Seed of Australian blue grass has been on the market for many years. This also is harvested in New South Wales, and consequently may not be as valuable as locally collected seed for sowing in Queensland.

—*C. W. Winders.*

Plate 77.

STUDENTS OF THE QUEENSLAND AGRICULTURAL HIGH SCHOOL AND COLLEGE ON THE OCCASION OF AN INSTRUCTIONAL VISIT TO THE LABORATORIES OF THE DEPARTMENT OF AGRICULTURE AND STOCK.

Back Row (left to right.—J. Hardcastle (Boonah), C. V. Cameron (Millmerran), A. W. Webster (Maleny), G. H. Allen (Salisbury), J. L. Horn (Calliope), M. Rocks (New South Wales), O. G. Callum (Kabra), A. W. May (Ipswich), R. E. Osborn (Bundaberg), J. M. Newman (Caboolture), A. Ferris (Wynnum).

Middle Row (left to right).—C. C. Harrington (Brisbane), L. Ward (Tambo), N. L. Harpham (Macalister), C. J. Burgess (Tasmania), Mr. P. J. Skerman (Agriculturist), Mr. R. A. Price (Herdsman), H. M. Ziegler (Tasmania), S. V. Petherick (Lockyer), J. E. Coaldrake (Brisbane), M. T. Stuart (New South Wales).

Front Row (left to right).—R. T. Bell (Ipswich), J. H. L. Armitstead (Warwick), C. S. Andrew (Crow's Nest), C. E. Kelly (Inglewood), C. E. Maxwell (Longreach), W. C. H. Ross (Rockhampton), R. M. Salisbury (Sandgate).

LUCERNE HAY.

In recent years lucerne hay values have been maintained at a high level because of a general scarcity of stored fodder. Baled lucerne hay or lucerne chaff and maize grain are now recognised as the basis of all supplementary or drought feeding, if the fodder has to be transported over long distances. Increased attention is therefore being given to the production of good quality lucerne hay. Good hay containing 45 per cent. to 50 per cent. of leaf will always command a good price, while a weathered or sweated consignment will be hard to sell.

Very careful handling is required from the time lucerne is cut until it is stacked or baled for market. Prime lucerne hay should be green in colour, dry, free from weeds or rubbish, and should contain a high proportion of leaf. Prevailing climatic conditions are naturally an important factor, and whenever possible cutting should commence in bright, fine weather. Lucerne should be cut shortly after the first flowers have appeared, when numerous young shoots will usually be observed at the base of the crowns. When the plants are allowed to become over mature, actual loss of weight and feeding value occur, as leaf will be lost, and the stems will harden, thereby becoming largely indigestible. It is customary to commence mowing in the morning, as early as possible, after any heavy dew has evaporated. During fine, hot weather, raking may commence about midday. Raking into windrows should, if practicable, be completed by nightfall, as much leaf may be lost if the lucerne is left too long in the swath. After wilting for a few hours in the windrows, fork into high narrow cocks which encourage the natural transpiration of moisture better than if broad flat cocks are made. If rain occurs the lucerne will require turning to prevent the formation of mould, but during fine, hot weather it is possible to stack within two days of cutting. Excess moisture will induce mould, and possibly combustion in the stack, while if the lucerne is allowed to become too dry it will lose appreciably in palatability, weight, and appearance. Before carting the stems should be tested by twisting them between the hands, when any excess moisture will become evident.

Wherever possible, lucerne hay should be stored in sheds, but if it becomes necessary to stack it in the field a frame-work of logs should be laid down, care being taken to keep the centre of the stack high during building. Large stacks which are likely to be held for some years may be protected by thatching or by a temporary galvanised iron roof.

Proximity and accessibility to the chief markets is obviously an important factor in the profitable production of lucerne hay for direct sale.

—H. W. Ball.

GRASS HAY IN THE MARANOA.

With the recent drought so fresh in memory, there should be no need to stress the value of building up fodder reserves when conditions are favourable. On many properties, a start can be made at the present time by storing excess grass. If the surplus of nutritious grass is not cut soon, it will mature and lose much of its feeding value.

Excellent hay can be made from common native grasses—such as love grasses, early spring grass, and star or windmill grasses. Where good stands exist on cleared areas—such as old cultivation paddocks

and creek flats—and a mower and rake are available, the grass can be conserved at little cost and will prove of value when natural feed again becomes scarce.

The grass cures very quickly and, in most cases, should be in the stack the day after cutting. Harvesting is, consequently, a relatively simple operation. The palatability and keeping qualities of the hay may be improved by sprinkling the several layers with a small quantity of salt as stacking proceeds. The merits of this cheap method of fodder conservation are realised by many farmers and graziers, but its more general adoption is warranted in view of its dual advantages of elimination of waste of good feed and inexpensive provision of fodder reserves.

—*C. H. Defries.*

JERUSALEM ARTICHOKE.

Like the sweet potato, the Jerusalem artichoke is a crop which should receive much more attention than it does at present, more particularly by those engaged in pig-raising in the drier farming districts, for not only is it very drought-resistant but its tubers are highly nutritious as well. The yield, which is controlled by the soil and seasonal conditions, may range from six to eight tons or more per acre, and although the plant does best on good friable loams, it will thrive on sandy, gravelly, or clayey soils, which enables the poorer patches of soil on the farm to be put to a profitable use.

The area intended for Jerusalem artichokes should be prepared in much the same way as for potatoes. The crop may be planted in early spring in furrows three feet apart, with the sets two feet apart. This spacing with medium-sized tubers will entail the use of between 4 and 5¾ cwt. per acre.

As with maize and potatoes, until the crop is 4 inches high, all cultural operations can be carried out with tined harrows working across the drills. Afterwards the cultivator will have to be used, as the condition of the soil and weed growth necessitates.

When the tops die, the crop is fit for harvesting, which can be accomplished most profitably by turning pigs on to the field. If it is intended to plant the same area in the succeeding season, it will be necessary to remove the pigs before all the tubers have been eaten, if replanting is to be avoided. The area should be cultivated in the spring. Subsequent working will be similar to that of the first season. The white and red varieties are considered to be the most hardy and prolific.

In France—as many ex-A.I.F. readers will remember—feeding pigs on artichokes is an old-established custom. The tubers are grown specially for pigs, cooked and fed in admixture with mill offals, residue of cheesemaking, and, when available, crushed cereals. That the mixture suits the pigs is fully borne out by the length of time it has been in use. As to the meat it produces, no Digger ever questioned the quality of Somme pork in the spring and early summer of 1918.

KILLING JOHNSTON GRASS.

As some doubt exists as to the right kind of soap powder to use in the preparation of a sodium chlorate spray for the destruction of Johnston grass, Mr. W. J. McBaron (Corinda) has courteously supplied an extension of his note "Killing Johnston Grass," which was published in the *Journal* for December (page 691). He writes:—"..... I have had several inquiries, the last from Atherton, North Queensland, all of them wanting particulars as to the brand of soap powder to use. . . Some who have written have tried the first spraying and are evidently having trouble in getting the second to spread and stick—being a more difficult job on the second growth.

"Any type of common soap powder will do—I used Hudson's. Use soft water and only mix enough soap powder to make the water slightly soapy before mixing the sodium chlorate. The only need of the soap is to make the spray spread and stick to the leaves of the grass. This can be greatly helped by spraying on a hot day after the morning crispness has gone out of the grass, and not spraying too late in the afternoon."

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the Advanced Register of the Herd Books of the Australian Illawarra Shorthorn Society and Jersey Cattle Society, production charts for which were compiled during the month of December, 1937 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
College Ettie 5th	Queensland Agricultural High School and College, Lawes	6,229·52	250·488	Trevlac General
JERSEY.				
MATURE COW (STANDARD 350 LB.).				
White Rose of Hamilton	J. Wilton, Raceview	11,099·74	668·02	Retford May's Victor
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Glenview Palatine Sultane	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,198·6	286·159	Trinity Governor's Hope
JUNIOR, 2 YEARS (STANDARD 230 LB.).				
Glenview Lady Lynn 4th	F. P. Fowler and Son, Glenview, Coalstoun Lakes	5,150·35	264·834	Trinity Governor's Hope

The Tropics and Man

Growth and Form.

Second Series: No. 7.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

"Mens sana in corpore sano" (a sound mind in a sound body) has been an excellent motto ever since the days of the Roman poet, Juvenal. The idea of a sound body has always been associated in men's minds with height, weight, and physical form. These "specifications"—to borrow the engineer's term—should of course be satisfied; but it is quite possible to satisfy these and still have an unsound body. The bronzed god of the surf, all too frequently, has a mouth full of dental decay, and I have seen many of the gigantic Slav wood-cutters in Western Australia suffering from "barcoo rot," a disease brought about by a lack of vitamin A. It must be borne in mind that the achievement of outward physical perfection is not an end in itself, nor is it a guarantee of bodily fitness in the true sense.

Throughout this series we have tried to look at the essential causes of different bodily functions in order that we can understand better how hot climates may affect them. Now, upon what does physical form depend? As in all bodily development, two sets of factors interplay—hereditary and environmental. The tendencies derived not only from one's immediate ancestors but from the whole line of development of the human race have an essential say in the form one develops. These tendencies, however, can be very greatly modified by one's own living conditions. The external forces moulding the plastic clay of heredity operate from the moment of conception.

Raw Materials for Growth.

Every single one of the myriads of tiny cells in the body has to be built up out of food—food to the mother, food to the child, food to the adolescent boy or girl. Every one of the infinitesimal molecules in those cells—and there are millions in each cell—have to be obtained from food. They must be selected and built together in exactly the right proportions—not too much of one substance, nor too little of another. Growth, obviously, is going to be most economically carried out, and the final results achieve the best form when the food is made to supply a sufficiency of each of these requirements in their *correct proportions.* When food does this, the diet is said to be correctly balanced. Certain items are more frequently neglected than others in diets in common use. Amongst these Cinderellas of diet are mineral salts (especially lime and phosphates) and vitamins; and it is a tragic comedy that these, above all, are the items most concerned in growth. With the exception of vitamin D, these deficiencies occur in the Queensland diet to as great an extent, if not greater, as they occur in English dietaries.

Importance of Good General Health.

No one would expect the satisfactory production of a first-class article from a factory in which discontent was rife, working conditions poor, or equipment insufficient. Similarly, good growth and physical

perfection cannot be expected from a body pulled down by chronic ailments, kept under insanitary conditions, or malnourished from insufficient or ill-balanced food. The general health of the body is essential for the welfare of any one process in the body, just as it depends upon the healthy carrying-out of the process. The body is a commonwealth of nations, each with its own job to do, and its own working conditions, and yet dependent upon all the other members for a continued happy existence. Any one member by faulty working can destroy the harmonious relationship so essential for unity. In the absence of a general agreement to settle opposing interests, unity is impossible.

To what extent does tropical life affect this co-operation which we know as health and through it the attainment of physical perfection of form? If one sets aside for the moment infective diseases peculiar to the tropics, disturbances are not likely to fall upon the growing person. Mental stresses, in an enlightened community, do not fall heavily upon the immature. Physical stresses are largely offset by the great recuperative and adaptive power of the young. Both of these impose their main burden upon the adult, whose bodily form is more or less set. They may bring about deterioration of this, but that is more difficult and of somewhat less importance than the prevention of its attainment by interference with growth.

In many tropical countries disease attacks the growing person with intense vigour. In Australia, thanks to many factors, of which the absence of a native population is an important one, this aspect is less prominent, and the *general health* of our growing children is as good as, if not better than, elsewhere.

Particular Tropical Stresses.

Two factors apparently exercise particular effects in determining bodily form in the Australian tropics. The first of these is activity. In common with that of other pastoral and grazing countries, a large section of our tropical population is engaged upon a life of great and free activity.

The pursuit of occupations in these primary industries calls for activity by a very wide range of muscles in the body. This leads not merely to the development of particular localized muscles and bones, but to the general development of the skeleton and muscles. Moreover, activity and not merely great strength is required, so that large masses of muscle are not developed; they would hinder rather than help in the activity required. For these reasons, a well-built but relatively slender type of bodily form is favoured.

The second factor is heat. Small young animals kept in hot atmospheres under healthy conditions usually show an enlargement of certain portions of their anatomy. Rats, for example, develop large ears and longer tails. At the same time, the average bodily weight is often reduced. In this way, a larger skin surface for a given size of body is exposed to the air, and a greater opportunity is enjoyed by the animal of getting rid of its body heat. It appears to have been satisfactorily established that the bodily form in North Queensland tends to be of the "lanky" type. This has been explained on the basis of these rat experiments as due to heat. I am not convinced that this is altogether due to heat, as the nature of the occupation probably has a large "say," and in any case the rat's heat regulation is on a very different footing

from man's. Loss of bodily weight in man often occurs in the tropics, and this, I think, is referable to heat, which causes loss of body water and reduction of appetite. On the other hand, loss of weight does not always occur, particularly in the "overseer" class and in housewives controlling native servants, in whom physical activity is reduced.

Conclusion.

Bodily form is the result of many interesting factors. There is a danger that lime, phosphate, and vitamins may be deficient in the raw materials supplied in the usual diets. General health is a most important factor. The active life and, to a certain extent, climatic conditions in Queensland favour the development of a slender wiry type, which should be regarded as the more normal condition for this State.

[*Photo. Main Roads Commission.*

Plate 78.

ON THE DESCENT FROM MOUNT OSSA TO KUNGURRI.—One of the many picturesque rain-forest roads in the Mackay District, Central Queensland.

TREATMENT OF COWS WITH SORE TEATS.

Wire cuts and wounds on cows' teats are among the disagreeable experiences in dairying. Milking irritates a wound and often causes bleeding, besides being painful. In such cases, absorbent cotton wool placed over the wound so as to make a soft pad between the milker's hand and the teat will give relief and arrest bleeding. After milking, an antiseptic ointment should be applied.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Tulip Satinwood.

N. Mc.C., Camp Mountain—

Your specimen is *Rhodosphaera rhodanthema*, the deep yellow wood, a small tree fairly common in South-Eastern Queensland. It has a rather decorative wood, suitable for general fancy woodwork, but has a tendency to split, and the logs are small and usually faulty. The Queensland Forest Service have given the name of tulip satinwood as the commercial name of the timber. Chinaman's cedar and yellow cedar are names often given to it.

Hedge Mustard.

J.H.B. (Ipswich)—

Your specimen is *Sisymbrium officinale*, the hedge mustard, a native of Europe but now spread very widely in most warm temperate countries. It is moderately common in Queensland, and is not known to possess any poisonous properties. It is not eaten by stock to any extent, but if eaten by cows gives rather a strong flavour to milk and cream.

A Smartweed and a Saltbush.

G.W.A. (Nanango)—

1. *Polygonum lapathifolium*, a smartweed.
2. *Salsola Kali*, a saltbush.

At various times the smartweeds have been suspected of poisoning stock, but the evidence has not been conclusive, and nothing has yet been proved against them.

Salsola Kali (saltbush), is mostly regarded as of fodder value. No poisonous properties have been attributed to it.

Poisonous and Other Plants.

J.A.R. (Yeerongpilly)—

1. *Cucumis myriocarpus*, wild cucumber.
2. *Swainsona galegifolia*, Darling pea.
3. *Amarantus paniculatus*, an Amaranth.
4. *Solanum esuriale*, a native solanum, the fruit of which is eaten by the blacks.

Of these, 1 and 2 are poisonous to stock, the first causing blindness, and the second causing nervous symptoms. Nos. 3 and 4 are not known to be harmful.

A Suspected Plant.

G.A.F. (Clermont)—

The specimen you sent has been determined as *Scævola æmula*, a native plant which has been found previously at Springsure and parts of North-west Queensland. It appears to be a fairly common species in western areas. Some of our specimens also show a hardened root stock as exhibited by your specimen. As far as we are aware, this is the first complaint we have had of this plant as a pest. Your specimen has been placed in our records, together with your remarks as to the possibility of the plant's causing trouble.

General Notes

Staff Changes and Appointments.

Messrs. St. G. Thorn, Bacteriologist, and J. A. Rudd, Government Veterinary Surgeon, Department of Agriculture and Stock, have been appointed members of the Veterinary Medicines Board.

Messrs. H. Keefer (Pittsworth) and H. Cairns (Scarness, Pialba) have been appointed honorary protectors of fauna.

Mr. J. V. Johnson, Lucinda, has been appointed an honorary ranger under the Animals and Birds Acts.

Messrs. K. M. Grant, B.V.Sc. (Mosman, N.S.W.), I. L. Johnstone, B.V.Sc. (Armidale, N.S.W.), and R. D. Chester, B.V.Sc. (Binnaway, N.S.W.) have been appointed Government Veterinary Surgeons, Department of Agriculture and Stock.

Mr. A. H. Taylor, mechanical engineer, Stanley River Works Board, Somerset, and Mr. C. Passinetti, Mourilyan, have been appointed honorary rangers under the Animals and Birds Acts.

Constable J. H. Clay, Dobbyn, has been appointed also an inspector under the Brands Acts.

Mr. B. Funnell, banana agent, Cairns, has been appointed also an inspector under the Diseases in Stock Acts, the Diseases in Plants Acts, and the Tobacco Industry Protection Act.

Messrs. W. D. Edwards (West Hill) and J. E. Barnes (Orkabie) have been appointed honorary protectors of fauna.

The Officer in Charge of Police, Stewart's Creek (Constable A. W. L. Ryan), has been appointed acting inspector of stock and inspector under the Slaughtering Act.

Mr. L. H. Roles, Clerk of Petty Sessions, Boonah, has been appointed also an acting inspector of stock at that centre in succession to Mr. F. B. Bergin.

The Officer in Charge of Police, Sapphire (Constable H. H. Eiser), has been appointed also an acting inspector of stock and an inspector under the Brands Acts.

Tomato Levy.

A Regulation has been issued under the Fruit Marketing Organisation Acts, empowering the Committee of Direction of Fruit Marketing to make a levy on growers of tomatoes in any part of Queensland with the exception of the Stanthorpe district, the sums raised by such levy to be expended in the interests of the tomato section of the fruitgrowing industry. Tomatoes grown in the Granite Belt area are covered under the Fruit and Vegetables General Levy operating in that district.

The levy shall be as follows:—

(*a*) On tomatoes sold or delivered by rail, road, or boat to factories at the rate of 5s. per ton;

(*b*) On tomatoes sold or delivered by rail to persons or firms other than factory at the rate of 1s. 8d. per ton, with a minimum of 1d., but no levy shall be collected on consignments of less than four cases.

(*c*) On all tomatoes sold or delivered other than by rail to persons or firms except factories at the rate of ¼d. per case, with a minimum of 1d.

The Commissioner for Railways may collect the levy on behalf of the C.O.D. on tomatoes consigned from certain railway stations, to the extent of 1s. 8d. per ton, with a minimum of 1d.

Wild Life Preservation.

An Order in Council has been issued under the Animals and Birds Acts, declaring the property of Mr. H. W. Bond and the adjoining camping and water reserve at Gladstone to be a sanctuary for the protection of animals and birds. Mr. J. E. Trihy, of "Cranleigh," Gladstone, has been appointed an honorary ranger for this property.

The property of Mr. J. H. C. Waddell, "The Cedars," North Mackay, has been declared a sanctuary under the Animals and Birds Acts. Mr. Waddell has been appointed an honorary ranger for this sanctuary.

Egg Board.

The following is the result of the Egg Board election:—

District No. 1.

	Votes.
Aubrey Cyril Mafeking Smith, Gooroolba	90
Ronald Benjamin Corbett, Woombye	73

District No. 2.

Frederic Stanley Morrison, Kenmore	128
Matthew Hale Campbell, Albany Creek	90

District No. 3.

Tom Hallick, Wynnum	198
John Peter O'Hagan, Carina, Belmont	114

District No. 4.

Johannes De Vries, Rosewood	108
Oliver George Millwater, Boonah	79

District No. 5.

Orton Augustus Windeyer Evans, Warwick	79
Walter Thomas Hughes, Toowoomba	48

Successful candidates will be appointed for a term of one year as from 1st January next.

Cotton Board Election.

Following is the result of the Cotton Board election:—

District No. 1.

	Votes.
Harry Reeves Brake, Wowan	201
Charles George Young, Wowan	78

District No. 2.

Ernest Schuenemann, Goovigen	199
George Herbert Bradley, Argoon	45

District No. 3.

James William Fleming, Biloela	163
Godfrey Francis McRae, Biloela	82

Messrs. Brake and Schuenemann have been re-elected to the Board, but Mr. McRae will be replaced by Mr. J. W. Fleming. The present members—Messrs. Basson, Lindenmayer, and Kajewski—have been returned unopposed for districts 4, 5, and 6 respectively. The new Board will be appointed for a term of three years as from 1st January, 1938.

Plywood and Veneer Boards—Terms Extended.

Orders in Council (two) have been issued under the Primary Producers' Organisation and Marketing Acts extending the operations of the Plywood and Veneer Board and the Northern Plywood and Veneer Board, respectively, for the period from 3rd May, 1939, to 2nd May, 1942.

Plague Grasshoppers Extermination Act.

An Order in Council has been issued under "*The Plague Grasshoppers Extermination Act of* 1937" abolishing the districts comprising the pastoral districts of Moreton and Darling Downs, which at the time of the passing of the Act were declared to be the districts in which the Act should be in force, and declaring that the Act shall extend to and be in force in the districts of Moreton, North-Eastern Darling Downs, North-Western Darling Downs, and Southern Darling Downs, described more fully in the Schedule to the Order in Council.

Rural Topics

Stock Poisoned by Yellowwood.

In a recent report the Government Veterinary Surgeon at Rockhampton advises that on several properties in the Emerald district cases of poisoning by yellowwood have occurred, and in some instances the proportion of animals affected was high. The poisonous nature of this tree was investigated in 1933 by the Department of Agriculture and Stock, the results being published in the *Queensland Agricultural Journal* for December, 1934. It was shown that whilst the leaves are not unpalatable to sheep, the continued eating of them leads to the sheep developing a peculiar type of nervous disorder accompanied by fits. As a result sheep are likely to collapse amongst fallen logs, or in stony country, or, again, in water holes, &c., from which they are unable to extricate themselves. In such circumstances, the animals, unless rescued, will die.

The sheep are prone to eat the leaves when these are shedding, as they do in dry weather, and when other fodder is relatively scarce. No antidote of the poison is known, but as the ill-effects are in part due to the very dry nature of the feed causing impaction and constipation, the provision of a laxative lick is indicated.

This tree, Yellowwood (*Terminalia oblongata*), is fairly common in parts of Central Queensland, but is not to be confused with the large timber tree common in South-Eastern Queensland and known by the same local name. The leaves are mostly an inch to an inch and a half long, the flowers are small and insignificant, and the fruit is flat on one side, ridged on the other, and developed on the sides into broad, thin wings. The whole fruit, including the wings, measures an inch to an inch and a half inch across.

How Much Water do Sows Drink?

From results published in the "Farmer and Stockbreeder" (England), it is learned that over a period of two years the water consumption of thirty-seven large white sows, tethered on grass, was measured. There was considerable individual variation, but the average rate during the suckling period was 4½ gallons per head per day. This was about half a gallon more per day than in the week before farrowing. The seasonal difference was slight and the correlation of water consumption with rainfall and weight of litter at weaning was not significant.

Water for Suckling Pigs.

Investigations at Wye College, England, indicate that sty-reared suckling pigs will drink water from two weeks of age, because, it is inferred, they do not obtain sufficient liquid from their dam.

Growth rate curves indicate that many piglings outgrow the milk supply of their dam when between three and six weeks old. This may result in the development of anæmia and a disinclination to eat at six weeks old. Mortality in such litters may be extremely high.

The supply of clean, cool drinking water to very young pigs, therefore, is a sound practice, conducive to rapid and economical growth.

Pig Management.

In some experiments at Bristol in England it was noted that in a total of 482 litters the average number of pigs per litter born alive was 8·7 and the average number weaned was 7·5, so that the weaning loss was 14 per cent., and from birth to market about 22 per cent. Out of 400 deaths from recorded causes (in England) erysipelas claimed 121, swine fever 91, scour and anæmia 113, chills and pneumonia 37.

In another report from Wye, England, on one farm the average number of pigs born per litter (179 litters) was 8·7, and the average number weaned per litter (177 litters) was 7·7 for three consecutive years, showing an average loss of one pig per litter. On the average of four farms 8·7 pigs per litter (188 litters) were born and 7.3 pigs weaned (171 litters), compared with another year showing 9.6 pigs (216 litters) born and 7·9 pigs weaned per litter, with an average loss over the two years of 1·6 pigs per litter.

Orchard Notes

MARCH.

THE COASTAL DISTRICTS.

IF the weather is favourable, all orchards, plantations, and vineyards should be cleaned up, and the ground brought into a good state of tilth so as to enable it to retain the necessary moisture for the proper development of trees or plants. As the wet season is frequently followed by dry autumn weather, this attention is important.

Banana plantations must be kept free from weeds, and suckering must be rigorously carried out. There is no greater cause of injury to a banana plantation than neglect to cultivate. Good strong suckers will give good bunches of good fruit. Weedy overcrowded suckers will only give small bunches of undersized fruit hard to sell, even at a low price.

Cooler weather may tend to improve the carrying qualities of the fruit, but care should still be taken to see that it is not allowed to become over-developed before it is packed, otherwise it may arrive at its destination in an over-ripe and consequently unsaleable condition. The greatest care should be taken in grading and packing fruit. Small or inferior fruit should never be packed with good large fruit.

There has been a marked increase in the banana thrips population in some districts in which this pest is well established. Growers who consider it necessary to deal with banana thrips are advised to apply to the Department for the latest information on how to deal with this pest.

The marketing of the main crop of pineapples, both for canning and the fresh fruit trade, will be completed in the course of the month, and as soon as the fruit is disposed of plantations, which are apt to become somewhat dirty during the gathering of the crop, must be cleaned up. All weeds must be destroyed, and if blady grass has got hold anywhere it must be eradicated, even though a number of pineapple plants have to be sacrificed, for once a plantation becomes infested with this weed it takes possession and soon kills the crop. In addition to destroying all weed growth, the land should be surface worked and brought into a state of nice tilth.

In the Central and Northern districts, early varieties of the main crop of citrus fruits will ripen towards the end of the month. They will not be fully coloured, but they can be marketed as soon as they have developed sufficient sugar to be palatable; they should not be gathered whilst still sour and green.

As blue mould is likely to cause heavy loss in coastal citrus, especially in long-distance consignments, special precautions should be taken for minimising this loss.

It must be remembered that the blue mould fungus will only attack bruised or wounded fruit; hence it is necessary to be careful that no injuries are given by the clippers or finger nails during picking. Fruit should be cut and not pulled. Long stalks which may injure other fruit must be cut away.

The fruit must be carefully handled and accurately packed so as to avoid bruising. Any injured fruit should be discarded. In order to reduce the number of fungus spores present in the plantation, all waste fruit in the orchard or packing shed should be collected at frequent intervals and destroyed by fire or burying.

Fruit must be carefully graded for size and colour, and only one size of fruit of one quality should be packed in one case. The standard bushel case, the inside measurements of which are 18 by $11\frac{1}{2}$ by $10\frac{1}{2}$ inches, is the best for citrus. The fruit must be sweated for seven days before it is sent to the Southern markets, in order to determine what fruit has been attacked by fruit fly, and also to enable bruised or injured fruit liable to blue mould to be removed prior to despatch.

Growers are reminded that the control of the bronze orange bug is best achieved by spraying with the resin-caustic soda-fish oil mixture normally either late in March or early in April. Applied at this time of the year, the spray can give a mortality of 98 per cent. of the bronze bugs, which are then present solely in the very young stages. This spray is also very effective against several of the important scale insects infesting citrus.

Red scale is a pest to which citrus growers will shortly have to give attention, it being considered that control is best established from the middle of March to early in April. Fumigation with hydrocyanic acid gas is most effective against red scale, but success may also be achieved with white oils or with the resin-caustic soda-fish oil mixture evolved for the control of the bronze orange bug. Red scale, of course, is pre-eminently a pest of the hotter, drier citrus districts.

Strawberry planting may be continued during the month, and the advice given in last month's notes still holds good. Remember that no crop gives a better return for extra care and attention in the preparation of the land and for generous manuring than the strawberry.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

THE advice given in these notes for the last few months regarding the handling, grading, and packing of fruit should still be followed carefully. The later varieties of apples and other fruits are much better keepers than earlier-ripening sorts, and as they can be sent to comparatively distant markets, the necessity for very careful grading and packing is, if anything, greater than it is in the case of fruit sent to nearby markets for immediate consumption. Instruction in the most up-to-date methods of grading and packing fruit has been published by the Department, which advice and instruction should enable growers to market their produce in a much more attractive form.

The same care is necessary in the packing of grapes. Those who are not expert cannot do better than follow the methods of the most successful packers.

As soon as the crop of fruit has been disposed of, the orchard should be cleaned up, and the land worked. If this is done, many of the fruit-fly pupæ that are in the soil will be exposed to destruction in large numbers by birds, or by ants and other insects. If the ground is not worked and is covered with weed growth, there is little chance of the pupæ being destroyed.

Where citrus trees show signs of the want of water, they should be given an irrigation during the month, but if the fruit is well developed and approaching the ripening stage, it is not advisable to do more than keep the ground in a thorough state of tilth, unless the trees are suffering badly, as too much moisture is apt to produce a large, puffy fruit of poor quality and a bad shipper. A light watering is therefore all that is necessary in this case, especially if the orchard has been given the attention recommended in these notes from month to month.

A PRODUCTION-PROTECTION SURVEY.

Statistics prepared for the basic wage case emphasised once again the seriousness of drought losses. These losses brought sharply under notice the importance of the pastoral lands belonging to the State and the necessity for some form of action to preserve the Crown estate and to maintain its value. The grazing areas are amongst the most valuable assets which the State possesses. The investigations of the Bureau of Industry revealed that fodder conservation for the West was too big and costly an undertaking for the individual or even for groups of individuals. Yet drought losses recur with sinister regularity—and, so far, an acceptable scheme of fodder conservation, even for the dairying districts, has not been propounded. As to the pastoral lands of the Crown, I suggested to the Minister for Lands that the problem might be approached from a fresh angle and that he might utilise the services of his field staff in the making of a "production-protection" survey. Mr. Pease approved the suggestion and put action in train. The scheme is fraught with possibilities, and indicates a genuine desire to evolve some practical measures to minimise drought losses in the pastoral areas and to preserve and protect the Crown estate in respect of both feed and water.

—From the Annual Report of Mr. J. D. Story, I.S.O., Public Service Commissioner.

Farm Notes

MARCH.

LAND on which it is intended to plant winter cereals should be in a forward stage of preparation. Sowings of lucerne may be made at the latter end of the month on land which is free from weed growth and has been previously well prepared.

The March-April planting season has much in its favour, not the least of which is that weeds will not make such vigorous growth during the succeeding few months, and, as a consequence, the young lucerne plants will have an excellent opportunity of becoming well established.

Seed wheat should be treated with copper carbonate for the control of bunt. For oats and barley seed the use of formalin or a reliable mercury dust is advisable.

Potato crops should be showing above ground, and should be well cultivated to keep the surface soil in good condition; also to destroy any weed growth.

In districts where the potato crop is subject to Irish blight it is advisable to spray the plants for the control of this disease. Bordeaux mixture of 4.4.40 strength should be applied at least three times at intervals of ten days to a fortnight, commencing when the plants are about six weeks old.

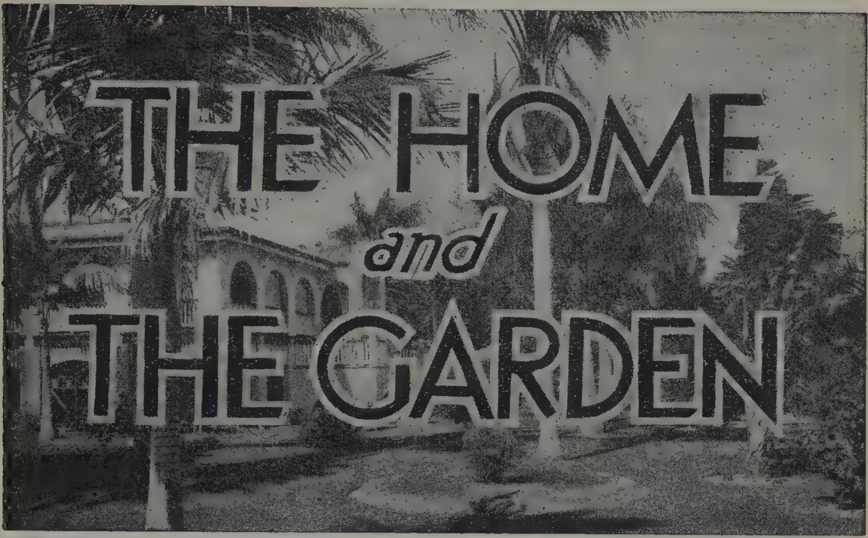
Maize crops which have fully ripened should be picked as soon as possible and the ears stored in well-ventilated corn cribs, or barns. Selected grain which is intended for future seed supplies should be well fumigated for thirty-six hours and subsequently aerated and stored in airtight containers. The germination of the maize is not normally affected by this treatment if dry and mature when treated.

The following crops for pig feed may be sown:—Mangel, sugar beet, turnips and swedes, rape, field cabbage, and carrots. Owing to the small nature of the seeds, the land should be worked up to a fine tilth before planting, and should contain ample moisture in the surface soil to ensure a good germination. Particular attention should be paid to all weed growth during the early stages of growth of the young plants.

As regular supplies of succulent fodder are essentials of success in dairying operations, consideration should be given to a definite cropping system throughout the autumn and winter, and to the preparation and manuring of the land well in advance of the periods allotted for the successive sowings of seed.

The early-planted cotton crops should be now ready for picking. This should not be done while there is any moisture on the bolls, either from showers or dew. Picked cotton showing any trace of dampness should be exposed to the sun for a few hours on tarpaulins, bags, or hessian sheets, before storage in bulk or bagging or baling for ginning. Sowings of prairie grass and *Phalaris tuberosa* (Toowoomba canary grass) may be made this month. Both are excellent winter grasses. Prairie grass does particularly well on scrub soil.

Dairymen who have maize crops which show no promise of returning satisfactory yields of grain would be well advised to convert these into silage to be used for winter feed. This, especially when fed in conjunction with lucerne or cowpea, is a valuable fodder. Where crops of Sudan grass, sorghum, white panicum, Japanese millet, and liberty millet have reached a suitable stage for converting into silage, it will be found that this method of conserving them has much to recommend it. If permanent storage facilities are not available on the farm the stack method offers a practical alternative. Stacking with a framework of poles, and well weighting the fodder, is necessary for best results. All stacks should be protected from rain by topping off with a good covering of bush hay built to a full eave and held in position by means of weighted wires.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

MEAN WHAT YOU SAY.

IT is most important that parents should mean what they say in dealing with their children, and that the children should know this. It is worse than useless to allow a child to do something one day and punish him for doing the very same thing next day. How is he to know what to expect? Last week mother did not allow him to play out on the street, but one day the week before she did. Naturally, being a clever, reasonable child, he thinks he will risk it again. Mother may not punish him.

Bribes and threats are wrong means of teaching a child to obey. If you tell a child that you will give him something nice if he does what you ask you are bribing him, and before long you will find he will do nothing unless he gets something out of it.

Very few of the parents who threaten their children mean what they say. A mother may say to her naughty child: "I will ask the policeman to come and take you to gaol." She knows it is not true. At first her threat frightens the child; then he learns that it is not true, and before long he takes no notice. Threats may turn him into a coward; every mother who wants her child to be brave should avoid them. On the other hand, if the threats are never carried out the child may grow indifferent. It is best never to threaten.

Children do not obey people whom they cannot trust, and parents who break promises to their children cannot expect to be trusted or obeyed by their children.

Speak Quietly.

Here is another point. When your child is not obedient do you become angry and raise your voice? That excites the child, and some children like such excitement very much. They will even do things they know are naughty just for the sake of seeing mother lose her temper. If parents can manage not to get angry they will find it much easier to teach their children to be obedient. Loud talking is a strain to listen to, and is bad both for children and for grown-ups. It makes the home noisy; noise makes everyone in the home nervous and irritable. Parents who always speak quietly find that their children will listen to them more willingly.

Be Reasonable.

A toddler's doings, which seem so trivial to many grown-ups, are really very important indeed to him; and the things that grown-ups think so very important mean nothing at all to him. He does not think, for example, it is important to give up his play and come to dinner as soon as he is called.

It is a good plan to allow the child a few minutes to finish what he is doing before you expect him to obey a command. Let him have five minutes' grace before mealtime and before bedtime, for instance. There are some things little children really cannot do, and yet they are often asked to do them—for instance, to sit still for a long time, to keep from making a noise for a long time. It is not fair to expect little children to do these things, which adults can, of course, do quite easily. The child's muscles are too busy growing to allow him to sit still for a long time. They need constant exercise—by wriggling and other means which sometimes annoy tired mothers—in order to grow. Only an adult, whose muscles have reached their final stage of growth, can discipline his muscles so that he can sit still for a long time. And making a noise is a part of the business of growing. The toddler's chattering and shouting are just as important to healthy growth as is the lusty crying of the healthy infant.

It is not really hard to teach a child to obey the first time you speak if you always speak quietly, never angrily; if you let the child find by experience that everything is pleasant when he takes notice quickly but not so pleasant if he does not obey. When the little child is good and obedient it is right for mother to show that she is pleased to allow some little treat.

Teach Children to Think for Themselves.

If people are to be happy when they grow up they must have learned to obey certain rules when they were children; but they must have learned to think for themselves. Children must be taught to think for themselves what is right for them to do. There are children who never do anything by themselves. They never think for themselves. They have to wait until someone tells them what to do. When they grow up they are very unhappy because they cannot be independent.

Let us teach our children to think for themselves, encourage them when they plan to do things without help, when they attempt to fasten their own shoes, to put on their own socks, to do up their buttons, to wash their faces. They may seem to be getting on very slowly. It takes time to let them make the effort to help themselves, but try to be patient while they accomplish what they are trying to do. Praise them for trying to help themselves. It will be all the better for them if they learn to be independent, and in the long run all the better for mother.

IN THE FARM KITCHEN.

VARIETY IN VEGETARIAN FARE.

In hot weather vegetarian dishes often make an acceptable change from a meat menu. Here are a few suggestions:—

Vegetable Omelette.

Take 4 eggs, 3 tablespoonfuls butter, 1½ tablespoonfuls chopped onion, 1½ tablespoonfuls sliced, cooked mushrooms, 1½ tablespoonfuls milk, ½ cupful cooked green peas, pepper and salt to taste.

Beat egg-yolk with milk till well mixed. Beat egg-whites to a stiff froth. Melt one tablespoonful of the butter in an omelette pan. Fold egg-whites into egg-yolks, with salt and pepper to taste. Pour into the buttered omelette pan. Cook till set below, lifting edges with a palette knife to allow the liquid to run below and set. When still moist on top, slip the well-drained vegetables, cooked in remainder of butter, and seasoned with salt and pepper, on top of the omelette. Fold and serve at once. Vegetables should be ready before you prepare the omelette.

Potatoes and Cheese.

Take 1 lb. boiled potatoes, 3 oz. grated cheese, 2 tablespoonfuls milk, 1 oz. butter, breadcrumbs, salt and pepper.

Mash the potatoes while hot, adding milk, cheese, seasoning, and half the butter. Butter a piedish with the remainder, strew it thickly with breadcrumbs, fill up with potato and cheese, and bake for half an hour in a good oven. Turn out and serve hot.

Curried Vegetables.

Take ½ oz. curry powder, 1 oz. butter, 1 small peeled apple, 2 teaspoonfuls lemon juice, ½ pint water, 1 small cooked cauliflower, ½ pint cooked peas, salt to taste, ½ oz. flour, 1 teaspoonful chutney, 1 teaspoonful black treacle, ½ gill cooked beans, 2 raw tomatoes, 1 cupful rice.

Chop apple and onion. Melt butter in a saucepan and fry onion lightly. Stir in flour and curry powder. Fry for a moment or two. Add apple, salt, lemon juice, and water. Bring to boil. Skim and simmer for half an hour. Stir in beans, sprigs of cauliflower, peeled, raw tomatoes, chutney, and treacle. Cover and simmer very slowly for twenty minutes. Throw rice into a saucepan of boiling water, and boil till nearly soft, then salt to taste, and finish boiling. Drain and hold underneath hot-water tap to separate grains. Add peas to curry. Serve in a hot dish surrounded with the rice.

Corn Rarebit.

Take 1 cupful tinned corn, 1 egg, small piece onion, 1 heaped tablespoonful grated cheese, 2 cupfuls tinned tomatoes, ½ tablespoonful butter, ¼ teaspoonful salt, pepper to taste, rounds of fried bread.

Melt the butter in a saucepan. Add chopped onion and tomatoes. Simmer till mixture is reduced to half the quantity. Stir in corn and simmer for ten minutes. Beat egg lightly and add. Stir over a stove, heat for one minute. Season to taste with salt and pepper. Heap on to rounds of fried bread, sprinkle with grated cheese, and brown under the griller. If not wanted strictly vegetarian, garnish each with grilled rolls of bacon. Serve very hot.

Vegetarian Cutlets.

Take 3 carrots, 3 turnips, 3 onions (cooked), ½ pint cooked lentils, curry powder, minced parsley, 2 eggs, breadcrumbs, salt and pepper to taste.

Mash the carrots, turnips, and onions together; then mix with the lentils, which have been drained as dry as possible. Flavour with curry powder, parsley, salt and pepper to taste; then bind the mixture with a beaten egg, taking care not to make it too moist. Mould into cutlets, brush over with egg, and coat with breadcrumbs. Fry in deep fat until brown. Serve immediately.

Cauliflower and Tomato Souffle.

Take 1 cold cauliflower, 1 lb. tomatoes, 1½ oz. butter, 1 oz. flour, 3½ oz. grated cheese, 2 eggs, 1½ gills milk, salt, pepper, 1 tablespoonful breadcrumbs.

Slice the tomatoes and divide the cauliflower into sprigs. Put the tomato and cauliflower into a fireproof dish, and season them with salt and pepper and 2 oz. of the cheese. Melt 1 oz. of the butter, stir in the flour, and add the milk gradually. Stir till it boils. Take the pan off the gas, and add 1 oz. of cheese and the beaten egg-yolks. Stir in the stiffly-beaten egg-whites, and pour over the cauliflower. Sprinkle with breadcrumbs and the rest of the cheese, and place the remainder of the butter in small dabs on the top. Bake in a moderate oven for forty-five minutes. Serve in the same dish.

Small Cauliflower Salads.

Cold cauliflower, salt and pepper, 1 dessertspoonful Worcester sauce, 1 tablespoonful chopped parsley, French salad dressing.

Put the cauliflower on a plate, season with salt and pepper, and sprinkle with a little French dressing. Leave it for an hour or two to become well flavoured. Wash the parsley, squeeze it dry in the corner of a cloth, and chop finely. Mix the Worcester sauce with three tablespoonfuls of salad dressing. Put the cauliflower daintily on small individual dishes, and sprinkle well with the mixture of sauce and dressing. Decorate with a little chopped parsley. One medium cauliflower will be sufficient for five or six salads.

Cauliflower Fritters.

Take ¼ lb. flour, 1 egg-white, ¼ pint water, 1 cauliflower, salt, seasoning, vinegar, deep fat for frying.

Sieve the flour and salt, and mix to a smooth batter with the water. Whisk the egg-white until slightly frothy, and stir in. Beat well for a few minutes, then leave the batter to stand for at least one hour. Take the cauliflower—use only the white. Break it into small, neat branches, and soak them well in cold salted water. Then put them into boiling water to which a little salt has been added, and cook gently until tender, but take care it does not break. Drain them well, then sprinkle with pepper and a few drops of vinegar. Take a deep pan about half-full of dripping, and put it on to heat; it will be sufficiently hot when a faint blue smoke rises from it. Dip each piece of prepared cauliflower in the batter, coat them well, then lift them into the hot fat and fry until golden brown. Then drain well on paper. Only fry four or five pieces at a time. Remember to lift them into the fat with an iron skewer. Reheat the fat before frying the next batch. When all are cooked, serve on a dish-paper at once, and sprinkle with salt.

Viennese Cauliflower.

Take 1 cauliflower, 1 hard-boiled egg, butter, breadcrumbs.

Clean the cauliflower well, and boil it in salted water until tender, but fairly firm. Take out carefully, so as not to break it. Allow to drain, then place in a buttered casserole dish. Over the top sprinkle some breadcrumbs, which have been previously browned in a little butter. Chop finely the hard-boiled egg, and sprinkle this over the top, covering it with a few nuts of butter. Put into the oven for ten to twenty minutes, and serve. This is a good way of serving cauliflower for those people who are not fond of too many sauces.

To Keep Cauliflower Fresh.

To keep cauliflower fresh, split the stem in four, slip a string around it, and hang the flower downwards. To avoid breaking a cauliflower whilst cooking, wrap the vegetable in a square of butter-muslin, tying it corner to corner, with a knot at the top. The vegetable may then be lifted out of the pan with a fork and left to drain in a colander, and it will come out whole just as before cooking.

Whiteness is a sign of freshness and quality in cauliflowers. Once they begin to "yellow," the flavour goes, too. Always trim away the outer leaves, and cut the stalk quite close. As the cooking proceeds, touch this stalk with a fork now and then. If it is tender, the vegetable is done. Over-boiling of cauliflower only destroys the nutritive properties and valuable salts, and causes it to be tasteless.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF DECEMBER IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1937 AND 1936, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1937.	Dec., 1936.
North Coast.	In.		In.	In.
Atherton	7·33	36	6·07	11·34
Cairns	8·74	55	4·55	8·95
Cardwell	8·27	65	2·08	12·22
Cooktown ..	6·64	61	2·64	7·53
Herberton ..	5·75	51	4·72	7·07
Ingham	7·05	45	0·66	12·98
Innisfail	11·88	56	1·87	16·77
Mossman Mill ..	10·51	24	2·18	15·04
Townsville ..	5·51	66	0·06	7·03
Central Coast.				
Ayr	4·03	50	..	8·16
Bowen	4·46	66	0·61	10·29
Charters Towers ..	3·29	55	1·81	3·56
Mackay	7·14	66	1·20	10·25
Proserpine ..	7·83	34	0·74	8·87
St. Lawrence ..	4·76	66	1·74	3·93
South Coast.				
Biggenden ..	4·73	38	2·31	5·19
Bundaberg ..	5·11	54	3·77	3·01
Brisbane	4·90	85	4·53	1·80
Caboolture ..	5·25	50	4·47	1·87
Childers	5·69	42	6·84	5·12
Crohamhurst ..	7·21	44	6·00	2·27
Esk	4·72	50	3·05	3·43
Gayndah	4·20	66	2·92	2·96
Gympie	5·44	67	4·23	3·76
Kilkivan	4·57	58	4·94	2·25
Maryborough ..	5·11	66	3·23	3·93
Nambour	6·80	41	5·16	1·38
Nanango	3·82	55	3·20	2·93
Rockhampton ..	4·82	66	3·24	2·64
Woodford ..	5·57	50	3·45	2·18

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Dec.	No. of years' records.	Dec., 1937.	Dec., 1936.
Central Highlands.	In.		In.	In.
Clermont	3·83	66	0·80	3·08
Gindie	2·81	38	..	2·56
Springsure ..	3·25	68	2·47	2·20
Darling Downs.				
Dalby	3·37	67	1·37	5·10
Emu Vale ..	3·51	41	2·28	3·35
Hermitage ..	3·01	31	0·95	4·68
Jimbour ..	3·33	49	1·53	5·56
Miles	3·17	52	2·17	3·38
Stanthorpe ..	3·61	64	3·10	5·59
Toowoomba ..	4·46	65	4·10	5·91
Warwick ..	3·46	72	2·69	5·72
Maranoa.				
Roma	2·57	63	1·44	4·96
State Farms, &c.				
Bungeworgorai ..	3·01	22	..	6·10
Gatton College ..	3·77	38	3·37	..
Kairi	6·30	21	..	..
Mackay Sugar Experiment Station	8·13	40	1·96	10·55

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—DECEMBER, 1937.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·77	89	77	94	29	72	17, 18	264	6
Herberton	..	85	63	91	6, 10	59	20	472	8
Rockhampton	29·84	92	73	101	9	67	1, 3	324	8
Brisbane	29·88	85	68	94	12	63	3	453	14
Darling Downs.									
Dalby	29·85	91	64	100	13	58	3	137	9
Stanthorpe	..	83	59	90	21	47	13	310	15
Toowoomba	..	84	62	92	14	57	2	410	14
Mid-Interior.									
Georgetown	29·79	98	75	102	6, 9, 10	68	19, 21, 22	481	8
Longreach	29·75	102	73	111	7	65	10	17	4
Mitchell	29·78	98	68	104	8, 13	55	10	61	6
Western.									
Burketown	29·76	98	79	105	6	73	6	1	1
Boulia	29·76	103	74	113	10	67	10	16	4
Thargomindah	29·73	99	73	112	24	60	12	6	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

MOONRISE.

	February. 1938.		March. 1938.		Feb. 1938.	Mar. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5·25	6·47	5 45	6·24	5·46	4·32
2	5·26	6·46	5·46	6·23	6·42	5·28
3	5·27	6·46	5·47	6·22	7·37	6·25
4	5·28	6·45	5·47	6·21	8·32	7·22
5	5·28	6·44	5·48	6·20	9·29	8·21
6	5·28	6·44	5·48	6·19	10·28	9·22
7	5·29	6·43	5·49	6·18	11·28	10·24
					p.m.	
8	5·30	6·42	5·50	6·17	12·36	11·28
						p.m.
9	5·30	6·42	5·50	6·16	1·40	12·28
10	5·31	6·41	5·51	6·15	2·36	1·27
11	5·32	6·40	5·51	6·13	3·35	2·20
12	5·32	6·39	5·52	6·12	4·28	3·10
13	5·33	6·39	5·52	6·11	5·18	3·55
14	5·34	6·38	5·53	6·10	6·1	4 36
15	5·34	6·37	5·53	6 9	6·42	5·15
16	5·35	6·37	5·54	6·8	7·21	5·52
17	5·36	6·36	5·54	6·7	7·58	6·31
18	5·36	6·35	5·55	6·6	8·35	7·8
19	5·37	6·34	5·55	6·4	9·14	7·48
20	5·38	6·33	5·56	6·3	9·55	8·29
21	5·38	6·32	5·56	6·2	10·36	9·13
22	5·39	6·31	5·57	6·1	11·20	10·0
23	5·40	6·30	5·57	6·0	..	10·49
					a.m.	
24	5·41	6·29	5·58	5·59	12·7	11·41
25	5·42	6·28	5·58	5·58	12·56	..
						a.m.
26	5·43	6·27	5·59	5·57	1·50	12·34
27	5·44	6·26	5·59	5·56	2·39	1·27
28	5·45	6·25	5·60	5·55	3·38	2·20
29			5·60	5·54		3·16
30			5·61	5·53		4·9
31			5·61	5·52		5·9

Phases of the Moon, Occultations, &c.

8th Feb. ☽ First Quarter 10 33 a.m.
15th „ ○ Full Moon 3 14 a.m.
22nd „ ☾ Last Quarter 2 24 p.m.

Perigee, 12th February, at 4.0 p.m.
Apogee, 24th February, at 11. 0 a.m.

Venus in its revolution around the Sun of 224 days will, on 4th December, arrive at a part in its orbit where it will be on the opposite side of our Luminary, with regard to the Earth, lost in its overpowering light. Shortly afterwards it will appear a little to the east of the Sun, and we may then look for its reappearance as an evening star. In spite of predictions it will be as surprising as ever when we see the beautiful white planet as though it had suddenly come from the depths of space within our vision.

The near approach of Mercury and Jupiter will occur below our horizon. Both planets set before the Sun.

Mercury rises at 4.42 a.m., 1 hour 43 minutes before the Sun, and sets at 5.26 p.m., 1 hour 21 minutes before it, on the 1st; on the 14th, it rises at 4.17 a.m., 1 hour 17 minutes before the Sun, and sets at 5.49 p.m., 1 hour 19 minutes before it.

Venus rises at 5.21 a.m., 1 hour 4 minutes before the Sun, and sets at 6.47 p.m., with the Sun, on the 1st; on the 14th it rises at 5.22 a.m., 12 minutes after the Sun, and sets at 6.50 p.m., 12 minutes after it.

Mars rises at 9.11 a.m., and sets at 9.19 p.m. on the 1st; on the 14th it rises at 8.37 a.m., and sets at 8.27 p.m.

Jupiter rises at 5.17 a.m., and sets at 6.43 p.m. on the 1st; on the 14th, it rises at 4.39 a.m., and sets at 6.1 p.m.

Saturn rises at 9.13 a.m., and sets at 9.25 p.m. on the 1st; on the 14th, it rises at 8.26 a.m., and sets at 8.38 p.m.

About the middle of the month the Southern Cross will reappear in the south-east with the Pointers just above the horizon. Northward the constellations will form a luminous arch. The most conspicuous stars being Canopus in Argo, above the Cross; Sirius in Canis Major; Rigel and Betelgeuse in Orion; Aldebaran in the V-shaped cluster; Capella in the great five-cornered constellation; Auriga near the northern horizon and in the north-east Procyon in Canis Minor; and Castor and Pollux in Gemini; all in fine colour-contrast. Among all these the fascinating little star-group, the Pleiades, will not be overlooked, seen as it were through a nebulous veil.

2nd Mar. ● New Moon 3 40 p.m.
9th „ ☽ First Quarter 6 35 p.m.
16th „ ○ Full Moon 3 15 p.m.
24th „ ☾ Last Quarter 11 6 a.m.

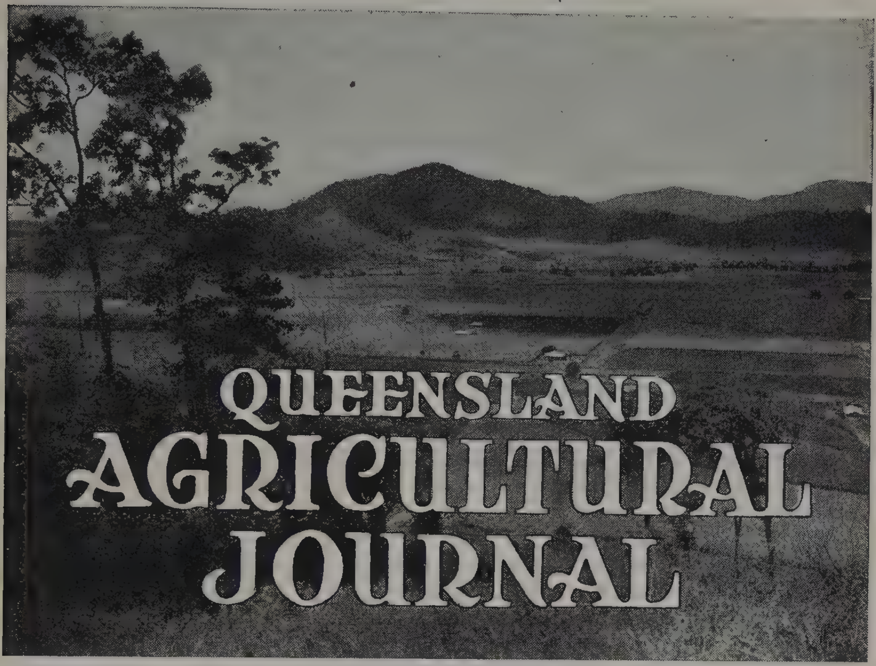
Perigee, 11th March, at 6.0 p.m.
Apogee, 24th March, at 7.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. XLIX. 1 MARCH, 1938. Part 3

Event and Comment

Allocation of Sugar Quotas.

IN opening a conference of sugar interests in Brisbane, at which proposals to establish an equitable basis for the allocation of sugar quotas were discussed, the Premier (Hon. W. Forgan Smith, LL.D.) delivered a notable address, in the course of which he said that on his return from the International Sugar Conference in London last year he publicly gave detailed information of the conclusions reached. At Mackay he had called attention to the assured quota for export and other issues. The views of the respective organisations were subsequently sought on the dissatisfaction expressed against the incidence of the peak year scheme.

At that time, said the Premier, he had pointed out that the Government had given the industry a charter, which justified him in expecting that the industry would itself prefer to keep this matter under its own jurisdiction. An important duty devolved upon the industry, and delegates were urged to consider the whole matter not as advocates, but as a tribunal upon which was cast a great responsibility.

It had always been the practice of the present and other Governments to seek recommendations from the industry itself. In the past those recommendations had been forthcoming, and he took it that such a charter and authority was something the industry should not hold lightly.

The high price of sugar in European countries was due to high tariffs and the consequent low consumption a head, compared with Australia's 112 lb. a head. It was unfortunate that it was not otherwise, but the industry must face the facts. They were living in a world that had many economic difficulties. Some of them were beyond the industry's immediate solution. In Queensland they must, therefore, recognise such powers as they had, and use them equitably and justly towards all concerned.

If sugar purchasing countries were in a position to use as much sugar as was being consumed in Australia there would be no need for this conference, but there was a limited market, based on limited capacity to buy. Therefore, they realised that they had certain known markets. Outside Australia there was a market for 400,000 tons. He had sought the utmost protection within the industry's economic ability in return for the embargo and in furtherance of the policy of settling the northern coastal regions of Queensland.

Effect was given to the White Australia policy largely by means of the sugar industry, and they owed it to the Governments who were responsible for the embargo to maintain the production of a quantum of sugar in keeping with Australia's needs and export conditions, continued the Premier. The Government was opposed to reducing settlement or the volume of employment. It desired the utmost production consistent with reasonable living conditions for farmers and wage earners.

Australia had a market for 750,000 tons of sugar, including export and home demands. It was hoped by many that the volume of sugar consumed in the countries representing the free markets would increase, and those concerned with the international agreement had bound themselves to do whatever possible to increase that consumption. But what was to be faced was that Australia's known market was about 750,000 tons.

The volume of production by the various signatories to the international agreement had not indicated any likelihood of a falling-off in their supplies. As a matter of fact, the authority set up to control the sugar agreement might be called upon to impose a further 5 per cent. cut in quotas applicable to foreign countries, to prevent glutting the free markets. Fortunately, this did not apply to the Dominions and Crown colonies, but the volume of sugar within the market must be taken into account by Australia and elsewhere.

Hopes for any great increase in world prices had not eventuated, the Premier stated, but the international agreement had really borne fruit by resisting bedrock prices. While this year's crop might realise only 4s. or 5s. a ton more than that of last year, this result had accrued despite an increase of 30s. a ton in freight. Wheat freights had been reduced, and it was hoped that later there would be a cut in favour of the sugar industry. The industry must bear in mind that it was and had been producing sugar much above the peaks.

The conference, which had been summoned by the Premier at the request of the sugar organisations, was attended by representatives from every mill district in the State. Besides sixty-six delegates there were their advisers and officials of the two sugar organisations and of the Queensland Bureau of Sugar Experiment Stations. The Minister for Agriculture and Stock (Hon. Frank W. Bulcock) also was present.

Equalisation Scheme Supported.

AT its concluding session the conference adopted the equalisation scheme formulated last year.

The conference also agreed to urge an addition of 2,500 tons to the Inkerman mill's peak quota under the official proclamation, and to recommend greater facilities for agreements in any area on control of production.

The equalisation scheme adopted sets out that the peaks and the pooling system shall be unchanged, except for two suggested alterations to give relief to certain sections.

The main alteration is that, if the No. 1 pool price could be declared at an average amount more than £17 a ton, that excess, provided it did not exceed 12s. 6d. a ton on No. 1 pool sugar, and subject to certain other minor provisoes, should be made available for distribution to the producers of No. 2 pool sugar.

Another provision is that the lighterage on excess sugar shall be met by the common pool instead of being, as at present, paid by the areas concerned.

Under existing conditions, sugar produced in Queensland is acquired by the State Government through the Queensland Sugar Board. There are, in effect, two pools. No. 1 pool is based on the peak production of any mill up to 1929, and the other constitutes sugar in excess of these peaks, and this sugar is acquired and paid for at export rate only.

In 1929 each mill was allocated a peak calculated mainly on its maximum production of sugar up to that year. The policy of the industry since then has been to agree that all sugar within the peak production should be acquired and paid for on an equal footing. Thus from the No. 1 pool Australia's requirements will be taken and paid for at the price of £24. The balance of the pool will be sold on the export market. Then an average price will be arrived at for all sugar in No. 1 pool.

No. 2 pool sugar was paid for at export price.

The aggregate quantity of sugar in the No. 1 pool is 611,428 tons.

The conference agreed that, as the Inkerman mill area had, through diversion of cane to another area, been deprived of the full benefit of its maximum production in the allocation of the 1929 quotas, the Government should be asked to add 2,500 tons to the peak quota of the mill.

At present the Regulation of Cane Prices Act provides that before an agreement can be adopted between growers and millers in any area for the control of production the agreement must be signed by 85 per cent. of the canegrowers who supply not less than 66 per cent. of the cane.

The resolution adopted by the conference asks the Government to amend the Act so that, for the control of production, an agreement shall be binding on all suppliers if signed by 70 per cent. of the growers supplying 75 per cent. of the cane, provided that it is approved by the Central Board. Agreements on matters other than the control of production shall be still subject to the original provisions.

Ca... MG

The Apple Leafhopper.

K. M. WARD, M.Agr.Sc., Assistant Research Officer.

THE apple leafhopper* is a newcomer to apple orchards in Queensland. The insect first appeared in injurious numbers during the 1937-38 season, but it was probably present in some parts of the district at an earlier date, though not as a pest of any consequence. The recent outbreak was confined to areas lying south and south-west from Stanthorpe. The species concerned is already well known as an important pest of the apple in New South Wales, Victoria, South Australia, and Tasmania.

Description of the Insect.

The adult leafhopper (Plate 79; fig. 6) is a small, slender, winged insect measuring about one-eighth of an inch in length. Its general colour is usually canary yellow, the eyes being dark and prominent. The immature forms, known as nymphs (Plate 79; figs. 3, 4, and 5) are wingless and pale-green in colour. The size of the nymphs varies with age, newly-hatched individuals being minute, while the nearly full-grown nymph is almost the size of the adult.

Host Plants.

The only fruit tree known to be seriously attacked by this pest is the apple. Pear trees and stone fruit trees adjoining and growing among heavily infested apple trees do not become injured. The insect has been observed, however, on hawthorn trees in Tasmania, and in the Stanthorpe district, adults and nymphs have this season been noticed living on small blackberry vines near an infested apple orchard. There is no record of its feeding or breeding on common orchard weeds or on cultivated plants, other than the apple, in the deciduous fruit areas.

Life History and Habits.

In any one season, usually two generations or broods of the apple leafhopper succeed each other between spring and autumn, with the possibility of a partial third brood late in the season. The first generation arises in spring from overwintering eggs which had been deposited in the bark tissues of apple trees during the previous autumn. The spring hatching commences in September, and extends over a period of several weeks. The nymphs develop to maturity through a series of moults in five to six weeks, and the yellow winged adults may be noticed on the trees from October onwards. Though the adults make short, darting flights, especially when disturbed, they are not often seen passing from tree to tree. A faint clicking sound can be heard when the insects are moving through the tree.

During late spring and early summer, the adult females insert their minute elongate eggs (Plate 79; fig. 1) singly within the tissues of the leaves, mainly in the stalks, midribs, and main veins (Plate 79; fig. 2). In New South Wales, and probably also in Queensland, these eggs hatch between early December and mid-February. Due mainly to the warm weather, the nymphs develop more rapidly than those of the

*Typhlocyba froggatti Baker.

Plate 79.

THE APPLE LEAFHOPPER (*Typhlocyba froggatti* Baker).—Fig. 1—egg × 30; Fig. 2—main leaf vein dissected to show eggs *in situ* × 30; Figs. 3, 4, and 5—nymphal stages × 20; Fig. 6—adult × 20; Fig. 7—view of adult head showing piercing mouthparts × 20.

first generation, and reach maturity in about three weeks. If uncontrolled, this second brood is much more numerous than the first, and generally causes the more serious injury to the trees and fruit. In autumn and early winter the adults lay their eggs mainly just beneath the surface of the bark of the tree, particularly on the current season's growth. The position of each egg under the bark is marked by a tiny, smooth, oval swelling. Some of the early-maturing females of the second generation may lay a few eggs in the leaves, and these, together with a small number of the eggs laid in the bark, sometimes hatch during the autumn and give rise to a partial third generation. The great majority of the eggs laid in the bark do not hatch, however, until the following spring, when they provide the source of fresh infestation.

Economic Importance.

The apple leafhopper can scarcely be ranked with either the codling moth or the fruit fly in economic importance, because it is not so destructive to the fruit crop, and it is more easily controlled. Leafhopper damage can, however, be very serious when the pest is allowed to become numerous in an apple orchard. The leaf injury caused by the insects when feeding is shown by the formation of pale greyish patches where the piercing and sucking mouthparts (Plate 79; fig. 7) have been inserted into the tissue. These patches coalesce late in the season, so that the whole of a leaf (sometimes with the exception of narrow green strips along the veins) often presents a pale, chlorotic appearance (Plate 80; fig. 1). The injury may develop further, and result in the yellowing and dropping of the leaf. The improper functioning of the discoloured leaves and any defoliation due to leafhopper attacks will tend to induce the formation of weak leaf and fruit buds, and so adversely affect the fruit crop carried by the trees in the following season.

Blemished fruit (Plate 80; fig. 2) is invariably associated with leafhopper attacks on apple trees, and the blemishes are due to excrement which accumulates on the surface of the fruit in the form of very numerous black specks. When partly dissolved by rain, dew, or spray material, these specks spread over the fruit as dirty brown streaks and blots. Although only on the surface of the skin, these unsightly marks are sufficient to render the fruit unfit for marketing without special treatment. Unfortunately, these blemishes cannot be removed easily. Each fruit must be wiped with a wet cloth before it can be satisfactorily cleaned; a dry cloth has little effect. Such wiping obviously increases the cost of preparing the fruit for the market.

Late varieties of apples are likely to be the most seriously affected because the pest population usually increases as the season advances.

Control Measures.

The basic idea underlying the control of the apple leafhopper is to prevent the normal seasonal increase to injurious numbers. Since the overwintering eggs laid in autumn are well protected by the bark in which they are laid, their destruction by ovicides does not seem feasible. The suppression of the first (the spring) brood is therefore essential, and control measures should be employed before any of the insects hatching in the spring can develop to the adult egg-laying stage.

Experimental work carried out in New South Wales and in Victoria has shown that nicotine sulphate is the most effective insecticide for

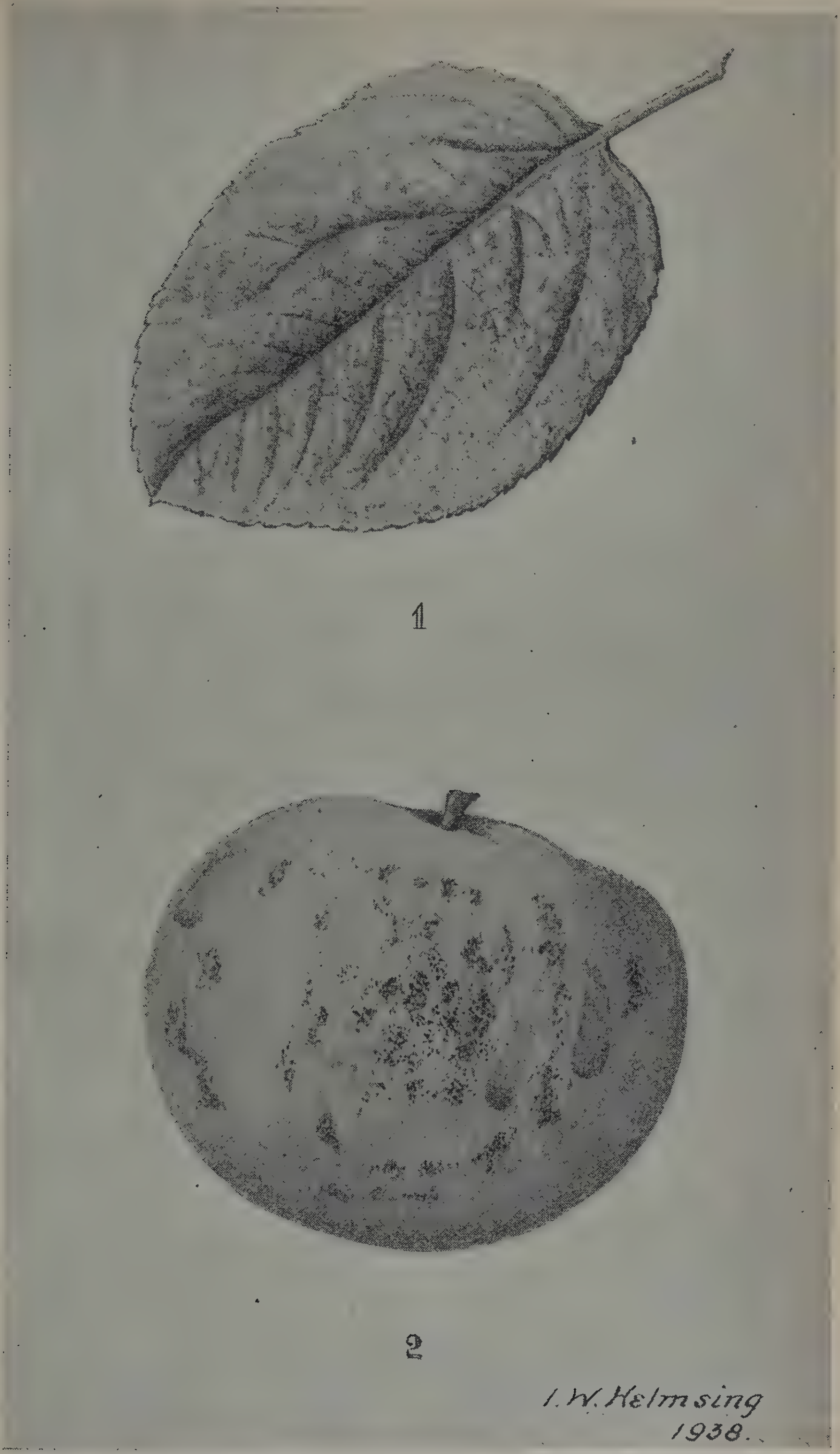


Plate 80.

Fig. 1—leaf showing chlorotic appearance caused by the apple leafhopper; Fig. 2—surface blemishes on the fruit associated with leafhopper infestation on apple trees.

the control of the insect. The two following sprays give excellent results if properly applied:—

1. Nicotine sulphate, 1 pint; white oil, 1 gallon; water, 80 gallons.
2. Nicotine sulphate, 1 pint; soap, 2 lb.; water, 80 gallons.

The apple grower has already to apply several sprays to his trees during the season for the control of codling moth, and it is frequently inconvenient to use special insecticides to check a pest such as the apple leafhopper. Fortunately, nicotine sulphate can be incorporated in codling moth sprays without losing much of its efficacy against the leafhopper. The combined spray is therefore very useful if leafhoppers are active when codling moth calyx or cover sprays have to be used. One pint of nicotine sulphate is added to 80 gallons of the prepared codling moth spray, and after thorough agitation in the vat, treatment is commenced as soon as possible.

On no account must soap be included in the combined codling moth leafhopper spray if lead arsenate is one of the ingredients as injury to both foliage and fruit may follow the use of such a mixture.

White oil alone does not satisfactorily control the apple leafhopper; in the nicotine sulphate-white oil spray, the nicotine sulphate is the active ingredient, white oil indirectly increasing its efficiency.

When an orchard has been infested in the previous season, the first spray for the control of the apple leafhopper should be applied in spring before any of the insects reach the adult stage in order to avoid further egg laying. Another spraying is required in about three weeks to destroy nymphs hatching subsequent to the first application. If the insects do not become noticeable in spring, treatment can be deferred until the position warrants attention in summer, when any one of the suggested treatments should be adopted.

The effectiveness of any spray treatment depends very greatly on the thoroughness of spraying. The whole of the tree must be treated, and it is most important that the spray should reach the under side of the leaves.

The above spray mixtures have little or no effect on the eggs, as they are always embedded in the plant tissues. These eggs are the main source of reinfestation of sprayed trees, and consequently it is always necessary to make at least two applications of an effective leafhopper spray with an interval of about three weeks between them in order to check the insect satisfactorily.

Though the apple leafhopper is winged, rapid dispersal is uncommon, partly because the insect does not fly over long distances, and partly because alternate hosts which would assist dispersal are few in number. Gradual dispersion may take place in the Stanthorpe area from an infested to a nearby uninfested district if the insect is able to live and reproduce on the widely distributed blackberry. Isolated outbreaks would seem to be due to the presence of over-wintering eggs brought into an orchard on nursery stock. When orchards are being established or replanted with young trees whose past history is only imperfectly known, the grower should periodically inspect the plants during the first two growing seasons for traces of the apple leafhopper. In the event of either nymphs or adults being located, control measures should be immediately applied in order to minimise the risk of the pest becoming a recurring trouble from year to year in the orchard.

Sterility in Cattle.

THE IMPORTANCE OF CONTAGIOUS VAGINITIS.

MARSHALL R. IRVING, B.V.Sc., Government Veterinary Surgeon.

THERE is probably no other factor, with exception of periodic drought conditions, which is responsible for greater economic loss to dairymen in Central Queensland than that which results from the failure of cattle to breed regularly. Indeed, the losses occasioned by sterility are rarely appreciated by the dairy farmer until the causes of sterility have become so firmly established in his herd that satisfactory treatment is practically impossible. There are several forms of sterility, each caused by certain specific diseases; but to the cattle breeder of Central Queensland that which is produced by the disease known as contagious vaginitis is at present by far the most important.

Economic Importance of Vaginitis.

Extensive observation of dairy herds in Central Queensland indicates that practically every herd is affected to a greater or less extent by contagious vaginitis. This disease is largely responsible for the frequent complaint made by farmers that they are experiencing difficulty in getting their cows in-calf. In some herds it is found that over 50 per cent. of the cows fail to conceive to the bull at a single service; while in some cases over 20 per cent. fail to conceive even after returning to the bull regularly for several months.

The losses caused by this temporary or permanent failure to reproduce may be summarised as follows:—

1. The farmer is feeding unproductive cattle even in times of scarcity.

2. It is impossible to arrange for calving to fall at a time when the pastures are at their best, and advantage cannot be taken of securing the highest returns in the flush season.

3. The farmer frequently spends much money on useless preparations which rarely contribute towards the elimination of the disease.

4. Cows from good milking strains may frequently have to be disposed of at butchers' prices.

5. Any attempt to improve the herd by the purchase of pedigree stock may be frustrated by the failure of expensive animals to reproduce, and so cause considerable financial loss to a progressive farmer.

6. The herd bull may be so overworked as to lose his breeding efficiency, particularly where the bull has free access to the herd.

Such losses are very difficult to assess, and may in some instances be very appreciable.

Causes of Sterility.

There are three main forms of sterility, each caused by a variety of diseases—

1. *Failure of the Cow to Show Oestrum (heat periods)*.—This type of sterility is not very common, and is usually caused by an abnormal

condition of the ovary in which the yellow body persists from a previous pregnancy. The treatment of this condition requires a sound knowledge of anatomy, and should not be attempted except by qualified persons.

Malnutrition may also lead to sterility of this type, though it is quite common for ravenous "bone chewers" to breed fairly regularly.

2. *Cows Showing Irregular Oestrum.*—Cases of sterility where the animals come "on heat" at frequent and irregular intervals are due to the presence of a cyst in the ovary. Such cows with diseased ovaries are better spayed and disposed of. This type of sterility is not common.

3. *Regular Oestrum with Failure to Conceive.*—This type includes the vast majority of cases of sterility which are met with in Central Queensland. Cows so affected may breed intermittently; but conception is usually delayed, and several services are required over a period of some months before a cow finally becomes pregnant.

Sterility of this type may be caused by a diseased condition of any part of the genital organs, and may in some cases be permanent. The commonest cause of this form of sterility is contagious vaginitis. Other diseases which produce more permanent interference with breeding are contagious abortion and septic conditions of the womb and the other genital organs. Fortunately these are at present not very widespread in Central Queensland, though contagious abortion, the most serious of all diseases of dairy cattle, is continually spreading.

Contagious Vaginitis and Sterility.

During the past five years the incidence of contagious vaginitis in Queensland herds has greatly increased until to-day few dairy herds are free from its effects, and many beef herds are becoming involved in the serious losses caused by the sterility it produces. Proof of its ability to produce sterility lies in the fact that proper treatment will largely eliminate such losses from an infected herd.

The cause of the disease is not definitely known, though it is certainly caused by a living organism which is capable of passing from one animal to another. The disease may be carried from an infected animal to a healthy one mechanically in discharges adhering to the bull's penis through successive services. It may also be conveyed to many females by a bull whose penis and sheath have become affected by the disease. Other means of transmission also exist, since the disease has been found in calves of under six months of age. Another common method of spreading the infection is the careless use of instruments by farmers who are not aware of the dangers resulting from failure to properly disinfect instruments and utensils.

Once established in a herd, it quickly spreads to all animals, and a high percentage of breeding irregularities will follow.

Symptoms.

Unfortunately, the presence of the disease in a herd is not usually suspected by a farmer until cows commence to repeatedly return to the bull for service. By this time the lesions are generally well established.

The first sign of infection is a slight reddening and swelling of the mucous membrane lining the interior of the lips of the vulva. In a few days numerous small red spots about one-twelfth of an inch in diameter appear around the clitoris and just inside the upper corner of the vulva. These spots become raised above the surface to small shiny nodules, and the surrounding tissue become oedematous and swollen. A scanty discharge of clear sticky material appears. Usually there is no apparent interference with the general health of the animal, except in very severely inflamed cases, when the animal shows signs of irritation by frequent swishing of the tail and attempts to rub against posts.

After about one month the nodules become pale and yellowish, with a glassy appearance, and the inflammation disappears. The discharge at this stage is thick and purulent. The disease may persist thus for months and a temporary sterility result. Sometimes the symptoms subside and the cow may conceive to the bull. Later the more acute symptoms may reappear.

In the more severe cases the nodules extend well into the vagina and the discharge becomes fairly copious. In such cases treatment is very difficult, and permanent sterility may result. Abortion is sometimes attributed to this disease in its most serious form; but it must be understood that contagious abortion is quite distinct, and has no connection with contagious vaginitis.

In bulls the disease is usually not so severe. Nodules are formed on the penis and inner surface of the sheath. In bad cases bleeding frequently follows the serving of a cow. It is not uncommon where this happens to find that a bull will later be incapable of fully erecting his penis due to the stricture of the inner sheath after healing has taken place. This renders him virtually incapable of serving a cow.

Diagnosis can be readily made by examining the internal surfaces of the lips of the vulva.

Treatment.

Severe chronic cases of this disease are very obstinate and defy all attempts at treatment.

If treated early in the outbreak the sterility resulting from contagious vaginitis can be largely eliminated. This has been repeatedly demonstrated where careful treatment has been carried out. The use of the tar-stick must be condemned, if only on account of its brutality.

The most effective treatment yet discovered is carried out on the following lines:—

1. First wash the external parts of the genital organs and tail with a solution of 1 per cent. Lysol or other reliable disinfectant.

2. Douche out the vagina with a solution of 1 oz. of bicarbonate of soda to 1 gallon of water in order to eliminate all mucus and discharges from the vagina before treating.

3. On every second day for a period of one month (fifteen treatments) inject into the vagina 1 pint of a solution made up of 1 oz. of sulphate of zinc to 2 gallons of clean water. This is best done by means of a 1-pint brass "cattle syringe" with at least two nozzles so that each nozzle can be placed in a disinfectant solution between individual cows.

This precaution is necessary to avoid further mechanical transmission of the disease. The whole herd should be treated at one and the same time irrespective of pregnancy and inclusive of calves over six months of age.

The sheath of the bull should be similarly treated.

4. Repeat this treatment with each cow following calving.

5. The bull should not be permitted to run at large with the herd. Quite apart from disease control, the isolation of a herd bull in a special yard has numerous obvious advantages.

6. Cows should be douched with a solution of 1 oz. of bicarbonate of soda to 1 gallon of water three hours prior to service. This will greatly assist in early conception.

7. Strict care should be taken to prevent the access of strange bulls to the herd and vice versa. The mutual exchange of bulls by neighbours is a distinctly risky practice.

8. In the purchase of new cows an examination for contagious vaginitis should be made and the treatment applied immediately on admission to the herd.

9. Where circumstances permit, it would be a distinct advantage to avoid the use of an old herd bull on young heifers. If a fresh bull from a clean herd is procured for the heifers the chances of early infection will be greatly reduced. This practice might involve paddock difficulties, but would be easily arranged if herd bulls were permanently yarded, as is most desirable. Very satisfactory results would attend the adoption of such a system.

The treatment outlined here may be considered by some farmers to be very troublesome. It will be recognised, however, that the sterility resulting from contagious vaginitis can cause serious economic loss, and as the materials required for this treatment are comparatively inexpensive, the trouble will be well justified if satisfactory results can be obtained. Experience in other States has shown that treatment conscientiously carried out on these lines considerably reduces the losses caused by sterility.

FEED EVERY CALF SEPARATELY.

It is very important that calves should be fed separately. The practice of feeding the whole mob out of tubs or troughs must be condemned strongly, because it allows the fast drinkers to get too much milk at the expense of the others. It also tends to the formation of a bad habit. The young calves drink faster than they should, which causes a variety of digestive troubles. Slow drinkers grow best when they get their full ration of milk.

Proper pens or bails for calf-feeding are well worth the time or money entailed. Too often there is a complete lack of conveniences for this important routine job.

NAVEL INSPECTION.

In newly-born animals, the navel is a prolific source of infection. Under farm conditions, it pays to treat the umbilical cord as soon as possible after birth. First, tie it with a string in a 5 per cent. carbolic solution; then paint the cord and surrounding area with a 5 per cent. iodine solution or dettol.

A CALF-PROOF GATE.

The handy type of gate illustrated is made of round bush timber. The top rail and latch posts are made of forked posts bolted together; the fork on the top makes the gate rigid, acting as a brace; the fork on the latch post is placed at right angles, preventing the gate from sagging and holding it upright when open. The hinge end of the gate is simple. Bore a hole in the top of the post and through the top rail, and insert an iron peg with a big washer on the under side. Taper the gate post at the top to stop friction. The centre rails are hung loosely with wire.

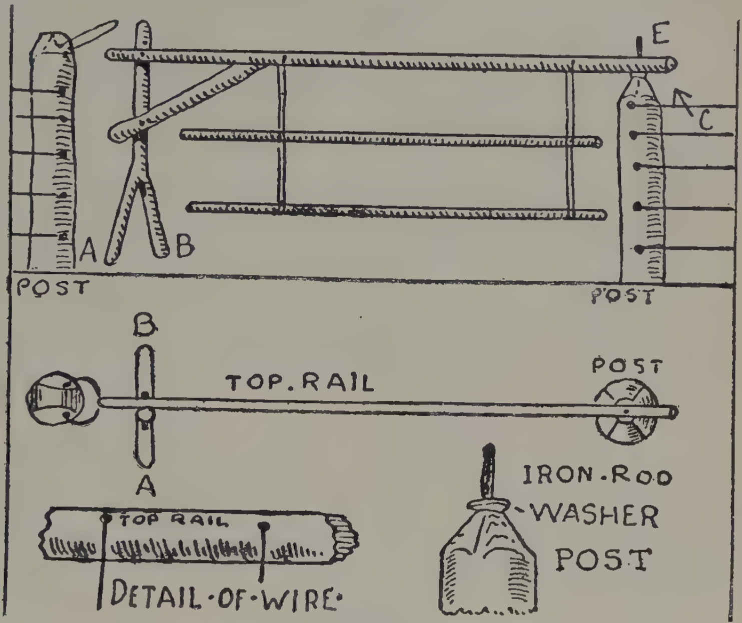


Plate 81.

The top drawing shows the gate in position. The upright latch post of the gate has a fork A B at right angles to the gate. E is the iron rod on top of the hinge post. C indicates the washer. The lower drawing shows a plan of the gate. The bottom left-hand sketch shows the position for boring holes in the top rail for wires near the upper edge of the rail. The bottom right sketch shows the gate post tapered off, the washer and the iron rod.

AN IMPROVED WIRE GATE.

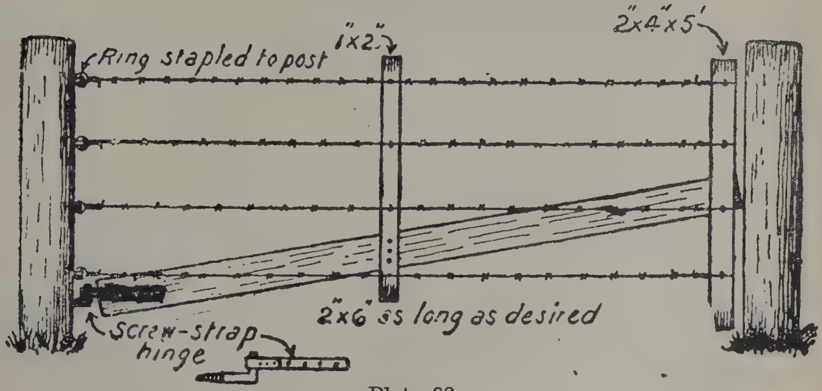


Plate 82.

An improvement on the ordinary "concertina" type of wire gate.

Management of Pigs in Relation to Disease Prevention.

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IT is probably impossible to even estimate the percentage of pigs farrowed in Queensland which do not reach a marketable age. All competent observers, however, appear to be in agreement that the percentage is a high one. At all events it can be stated definitely that it is considerably higher than it should be, and moreover, higher than the pig industry can afford if production is to be pursued at reasonably profitable levels.

The losses, taken by and large, are invariably put down at the door of disease and, whilst this is largely true, it would be more correct to say that they are due *indirectly* to disease, and *directly* to errors in management. Diseases of pigs are, for the most part (more so than with any other class of stock), preventable, and, therefore, can be truthfully stated to be dependent for their existence on faulty management; they are more easily preventable by reason of pigs being marketed at a much earlier age than other classes of stock, coupled with the fact that they are under direct observation at least twice daily.

Management includes all matters relating to breeding, feeding, and accommodation. All too often, farmers fail to appreciate that these three things are intimately related, so much so that excellence in one department is almost useless in the absence of adequate attention to either one or both of the others. It is not sufficient to have a "good" boar and "good" sows. Excellent as they may be, losses will occur if the feeding and/or accommodation are at fault.

Having made up his mind whether he is going to cater for the pork or bacon market, and selected a breed suitable for the purpose (this is outside the scope of this article), the farmer should then devote all his talents to securing and maintaining animals which are vigorous, thrifty, and endowed with good constitutions.

It should be remembered that it is bad practice to buy weaners or store pigs for fattening purposes. It is a questionable practice on economic grounds, but apart from this aspect, disease is often introduced amongst otherwise healthy pigs, sometimes with very serious consequences, as many a farmer can testify to his sorrow. It is far safer to aim at keeping a clean piggery and rearing one's own pigs. If, for some reason, store pigs must be purchased, then unquestionably they should be isolated for three weeks before allowing them to run with pigs already on the farm.

Gilts are commonly served at 6-7 months. This to too early an age and although often no trouble results, it can and does sometimes lead to difficulties in breeding later on in the life of the sow. Deformed or dead piglets are also sometimes seen as the result of service at too early an age, especially be it noted, if the feeding is at fault. Gilts should, as a general rule, not be served before 8-10 months old. Likewise in the case of young boars, only a very few sows should be given until they are over 10 months old. Too early and too frequent service results in lack of desire, or if service is carried out, in unsuccessful matings.

Feeding.

It is not intended in this section to deal so much with what should be fed to pigs, but rather in a general way to discuss feeding methods. On the average farm it is safe to say that the staple food for pigs is skim milk, and further that this is given in troughs made from hollowed out logs. Most farmers sense, without having to be told, that such troughs are not all that they might be. Over and above this, however, they often do not improve matters, countering criticism with the statement that they cannot afford anything better. The answer to this is that they cannot afford to be without a type of trough which represents a vast improvement on a hollowed log.

The hollowed log is a type of trough which is difficult to clean even when new, but with increasing age the presence of numerous cracks and crevices greatly increases the difficulty. Milk and swill soak into the gaps, putrefy and form an excellent medium for the development of germs. Some of these germs can and do produce disease, and as they mix with the milk each time it is poured into the "trough," the objections are obvious. As pigs will, if not prevented, get their feet into troughs, and often deposit dung and urine therein, further objections are raised, as disease producing agents are commonly distributed as a result. Over and above these considerations, if a farmer places a reasonable value on his labour, he will be greatly surprised at the cost of a hollowed-out log.

What is to take the place of a hollowed log? The designs and recommendations are numerous and only broad general principles can be discussed here. Obviously, to approach the ideal, they must be constructed of some impervious material, have no "cracks or crannies," be capable of easy and effective cleansing, and finally be so designed as to prevent pigs getting into them. Concrete is undoubtedly the best material to use, but it must be well made and well finished off (smoothed) and as milk (particularly if sour) has a very destructive action on it, the trough should be treated with silicate of soda in order to resist this action. A bung hole is usually provided at one end, but as these frequently get out of order as the trough ages, it is perhaps better to dispense with them altogether and instead have the ends of the trough curved or "scooped" inside so that food remnants can be easily removed with the aid of a brush or broom. Wrought iron troughs are also excellent but are expensive. Galvanized iron troughs are too light and have but a limited life.

Wooden troughs can be made so as to be fairly satisfactory, provided that machine-sawn hardwood is used and they are well jointed, and tarred thoroughly before use. The best of them is, however, difficult to clean, on account of the absence of rounded ends. All troughs should be swilled out with cold water shortly after skim milk has been consumed by pigs. More milk than the pigs can consume in quick time should never be placed in troughs because any surplus remaining in the troughs quickly becomes sour and unhealthy.

Whatever be the material the troughs are made from, put them on raised platforms projecting 3 feet either side, and have the platform, in turn, mounted on skids made of 6 by 4 inch timber, so that the whole thing can be moved about from time to time. In this way the ground in the immediate vicinity of the trough can always be kept reasonably sweet and clean. An overhead batten made of 4 by 1 inch

timber, and suspended at a height of 8 to 12 inches by means of uprights at either end, will effectively keep pigs out of the trough.

In regard to the handling of skim milk. The usual practice is to run off the milk from the separator into "drums" or vats, which often are not washed out, and are rarely, if ever, properly cleansed. They become coated with a most disagreeable and unhealthy scum, in many instances several inches thick. The milk becomes not only tainted but often is actually putrid. No farmer would think of feeding such milk to calves or to orphan foals or lambs, but for some obscure reason the pig is believed well able to withstand such an outrage on the digestive system. If farmers could only see and appreciate the extent of gastritis and bowel troubles in pigs fed on such material, they would very quickly change their ideas on the subject. There is no objection to sour milk for pigs if it has been allowed to sour under sanitary conditions, but even so, for pigs before and soon after weaning, skim-milk is better if fed fresh. For older pigs, if sour milk is going to be fed, it should be fed always and not interspersed with fresh, otherwise scouring is apt to occur.

If a farmer is not prepared to clean and scald his "drums," vats, buckets, and troughs at regular intervals, digestive disturbances must be expected and there need be no mystery as to why the pigs are not doing as well as they might be.

One other aspect of skim milk feeding can be dealt with here, and that is its value as a feed in relation to disease prevention. Skim milk is an unbalanced feed for pigs when fed alone. It is far too watery (does not contain enough solid matter, excellent though the quality of that may be). The result is that, in an effort to satisfy their appetites, pigs will take in a great deal more liquid than that for which their digestive systems are designed. "Pot bellies" result, and the pigs do not make rapid gains. Feeding skim milk alone is also a wasteful practice and amounts to throwing money away, by reason of the fact that it contains more protein (belonging to the more expensive class of stock foods) than the pig requires. Most farmers would probably be greatly surprised to learn that skim milk, when fed alone to pigs, may only return them as little as one half-penny per gallon, whereas when fed in conjunction with other appropriate foodstuffs, it may return under favourable conditions as much as twopence per gallon.

Apart from the above considerations it is necessary to remember that skim milk is lacking in vitamin A and has but traces of vitamin D. The former is essential for growth, and the latter for bone formation. Vitamin A also has an important bearing on diseases of the respiratory system, e.g., pneumonia, coughs and colds, and probably also worms. Adequate amounts of this vitamin in the food render pigs (in common with other animals), less susceptible to such complaints. In addition, brood sows fed on skim milk alone may fail to come in season, or if they take the boar may not breed.

Vitamin D has a bearing on "stiffness of the hind legs," and in some cases, paralysis of the hindquarters.

Liberal amounts of vitamin A are present in fresh green pasture, so that if pigs are allowed access to such pastures an important step in a campaign for disease prevention will have been taken. If it is not possible to run pigs on pasture, then fresh greenstuff (or lucerne hay) must be cut and given whenever possible, if the health of pigs is to be

safeguarded. Yellow corn (but not white corn), also supplies vitamin A but even when this is being fed, greenstuff is probably still required for best results.

Vitamin D is supplied by the action of the sun's rays on certain substances in the pig's skin. There is ordinarily therefore no need to anticipate a deficiency of this vitamin. In certain parts of Queensland, however (notably the Atherton Tableland), there are periods of the year when very little direct sunlight is in evidence for weeks on end. Under such conditions cod liver oil, which is rich in vitamin D, could with decided advantage be given in the milk, more especially to young pigs before and shortly after weaning.

The idea is doubtless revolutionary to Queensland farmers at large, but is nevertheless well worthy of trial. High-grade cod liver oils can be purchased very reasonably in one-gallon lots, and as the oil is also rich in vitamin A, its inclusion in the ration will have a double advantage.

The feeding of skim milk is also intimately related to tuberculosis in pigs. If some of the cows from which supplies of skim milk are obtained happen to be affected with tuberculosis, then it is quite likely that the germs of this disease will be present in the bulk milk. Pigs drinking this milk will contract the disease and condemnations with consequent loss to the farmer will follow when the pigs are slaughtered for human consumption. One other aspect of tuberculosis in pigs in relation to feeding can be noted here, and that is, if pigs are permitted to run at grass on pastures grazed over by cattle then they will be further exposed to risk of contracting the disease, as tuberculous cattle often pass tubercle germs in their dung. It is young pigs that are most frequently seen on cattle pasture, and, as young pigs as a class are more susceptible than older pigs, the risks of such a practice must be immediately apparent.

Skim milk is comparatively rich in minerals, but owing to the pig's large requirements for these substances the provision of a lick is advisable, especially when only small amounts of milk are available. A reliable lick is made by mixing stock salt (40 parts) and sterilized bone meal (60 parts). Bone meal contains lime and phosphorus, and lack of these is an exciting cause of "rickets" and paralysis. Some cases of "trembling" and "shivering" can also be traced to a lack of lime.

Salt, contrary to popular belief, is advisable for pigs. It is a valuable aid to digestion and assists in the well-being of the body as a whole.

A lick such as the one above is of especial value for brood sows, and, if desired, can be given in the food at the rate of one heaped dessertspoonful daily.

For young pigs the addition of clear lime water to skim milk at the rate of $\frac{1}{2}$ pint to 1 gallon is excellent. It aids digestion, helps to prevent scouring, and ensures healthy and normal bone formation.

Accommodation.

Bad accommodation is often associated with incorrect feeding in causing disease amongst pigs. Under natural conditions pigs graze at will over large areas; they drink and bathe in running streams; and have ample shade when required. Compare this state of affairs with that to which domestic pigs are obliged to conform. Often they are

enclosed in small yards in low-lying situations; there is little or no facility for exercise, and in wet weather the yard may become a quagmire. In addition the dung and urine which is voided daily by the enclosed pigs is allowed to accumulate and, in the course of time, grossly contaminate the ground. Many of the agents which cause disease are present in dung and urine (this applies particularly to parasitic diseases) so that the importance of contaminated ground is obvious. Too often the same yards have been in continuous use for 20-30 years, and under such circumstances there should be no cause to wonder why pigs fail to do well.

The present-day pig has for so long been reared under artificial conditions that he has lost much of his former constitution and vigour, and is now affected adversely by dampness, draughts, excessive heat or cold, and more particularly by sudden changes in temperature (i.e., "changeable weather"). Pigs therefore require carefully-planned shelter if diseases such as pneumonia, catarrh, rheumatism, and paralysis are to be avoided.

In regard to the general layout of piggeries there is not the slightest doubt that, while farmers continue to hold the view that they cannot afford the time and labour necessary to keep semi-intensive piggeries in a sanitary condition, the only solution is to give over much larger areas to the raising of pigs than is the general custom at the present time. The grazing or "paddock" system represents a partial return to native conditions and has many points in its favour from a hygienic point of view. There is not the same tendency for dung and urine to contaminate the ground as is the case with the semi-intensive system, so that the pigs enjoy comparative freedom from parasites, and, in addition, benefit greatly from the continuous supply of green feed. A sufficiency of exercise (particularly important with dry sows if farrowing troubles are to be avoided) is also provided. It is, however, essential to have paddocks of sufficient area to keep them always well grassed, and to enable a paddock to be "rested" from time to time (i.e., to adopt rotational grazing). The number of pigs which can be run to the acre and allow of these considerations being fulfilled can only be determined by experience in different localities. Wherever possible the use of cultivated crops, in addition to grass pasture, should be seriously considered.

The equipment used in the paddock system should be movable. This can be effected by mounting the troughs and sheds on skids; they can then be moved about from time to time, the ground in their immediate vicinity being in this way prevented from becoming bare and contaminated.

Where it is not possible to run pigs on the paddock system and they are perforce confined to small yards, increased attention and labour is necessary if the yards are to be kept in a sanitary condition. There should be a sufficient number of yards to enable at least one to be kept empty at all times. Under this system, when a yard becomes bare and foul from constant use it can be ploughed or dug up, limed (with advantage), and a suitable crop sown. This has the two-fold effect of purifying the soil and providing good food.

A common fault with piggeries of the semi-intensive type is to have them in level or lowlying situations. In most of these instances the farmer has obviously allowed closeness to the dairy to be the prime consideration in selecting the site.*

* 150 feet is the shortest distance allowed by law between a dairy and a piggery.

Admittedly with piggeries of this type, proximity to the separator-room is an important consideration, but it should not be allowed to outweigh the necessity for a site which will give good drainage and thus eliminate the risk of disease from mudholes and quagmires. This does not mean that a piggery should be built on the top of a hill (the pigs would be exposed to every wind that blows), but rather on sloping or rising ground. The slope of the selected site should face in the opposite direction to that from which come the prevailing winds—e.g., on the Atherton Tableland all the "weather" comes from the south-east, so that there it would be a distinct advantage to be on a slope having a north-easterly aspect.

The sheds used for accommodating pigs should have an open front facing north-east. This allows the morning sun to penetrate inside the shed, and, as sunlight is an efficient disinfectant, a very good purpose will thus be effected. Floors should be impervious to moisture. Rarely is this the case on the average farm. Earth floors are commonly used but have many serious disadvantages. They cannot be kept level, and develop hollows which serve as receptacles for moisture and filth. They are often cold and nearly always damp. Added to this, they are impossible to clean and disinfect. In short, they are not conducive to the success of any campaign for the prevention of disease.

Concrete makes the most sanitary floor, but as it is cold and hard necessitates a wooden sleeping platform. Wooden slabs laid on the ground are but little better than earth floors.

A floor made of machine-sawn hardwood is, however, quite satisfactory, provided it is well jointed and tarred.

Walls of sheds must be draught-proof and allowance must be made for abundance of fresh air by leaving a ventilation space all round under the roofing.

Too often the oldest timber about the farm is used in the construction of pig houses. This is false economy. Such timber provides harbour for parasites and disease-producing agents, and brings about damp, draughty conditions inside the house.

No matter what the type of house, if it is a fixture pigs will, in the course of time, scoop out the earth on the shady side, usually the south-east side, this by reason of the fact that they lie there during the heat of the day in order to have the benefit of the breeze in addition to shade. Inside the house they get shade but no breeze. It is advisable in such circumstances to place a low wooden platform on the ground in the situation concerned, otherwise a quagmire will result in wet weather, and as this would be right alongside the house, it is particularly undesirable. Shade trees and shrubs are desirable under summer conditions in Queensland, but they should only be allowed on high ground. Adequate shade will do much to eliminate cases of heat stroke and apoplexy. The ordinary galvanized iron roof makes sheds too hot for pigs in the summer, and if additional shade is provided the comfort of the pigs will be much enhanced and a healthier and more thrifty animal result.

If the floor of a pig shed is a raised one (and if made of hardwood, it should be), another common fault is to find pigs camped under the house. This again is a most undesirable practice, as the ground under

the floor does not get any sunlight and thus is apt to become a hotbed of disease. This is particularly likely to happen where the floor is not impervious and moisture and filth drop through. The space under the floor should be effectively boarded up if risk of disease from this source is to be obviated.

Wallows, unless properly constructed of concrete, should not be tolerated. The ordinary mud wallow is a receptacle for filth and infection, and as such is a continuous source of danger to the health of pigs.

A very valuable addition to any piggery is a quarantine or isolation pen. The importance of isolating sick pigs at the earliest possible stage of an outbreak (or suspected outbreak) of infectious or contagious disease cannot be over-emphasised.

Too often a farmer fully appreciates the necessity for the isolation of sick pigs, but having no quarantine pen or "hospital" is forced to just put them "over the fence." Under such circumstances the sick pigs promptly take up a position alongside the fence separating them from their former abode and the risk of further pigs becoming infected is but little reduced.

If sick pigs are allowed to run with healthy pigs the disease, if "catching," will continue to attack fresh pigs until all the susceptible pigs in the yard are affected. On the other hand, if sick pigs are promptly removed and isolated some distance away from the main piggery, then the spread of disease will obviously be checked (by reason of the removal of a source of infection) and losses considerably reduced.

Another advantage of an isolation pen is that pigs which have become lame, either through injury or some minor disease process, can be put aside and afforded the chance of recovering without interference by their fellows.

It is perhaps hardly necessary to mention that the isolation pen should be thoroughly cleansed and limed after each period of tenancy, otherwise disease germs will tend to linger and infect future "patients."

Measures for Prevention of Parasitic Diseases.

Diseases due to parasites are responsible for such a large proportion of the total losses from disease of all kinds that they warrant some special observations, even in an article of such a general nature as this.

Reference has already been made to the fact that worm infestation arises as the result of the contamination of yards and feed troughs by dung and urine from infested pigs. It is well known by farmers that worms cause pigs to be unthrifty and slow in growth, and further that worms may be present in one or more of the following situations in the body, viz., stomach, bowels, lungs, and kidneys. It is also generally appreciated that young pigs may die if treatment is not undertaken. Just by what means pigs become worm infested is not however nearly so well understood. The position can be stated very briefly as follows:—

Male and female worms are present in an infested pig. The male fertilizes the female and the latter then lays eggs which are passed out in the dung of the pig (in the case of the kidney worm, in the urine).

The eggs are naturally very small and can only be seen with the aid of a microscope. What they lack in size, however, they make up in numbers. The female large round worm of pigs (found in the small intestine or first portion of the bowel) is said to lay as many as 27,000,000 eggs during its lifetime.

Pigs can only become infested with worms by swallowing worm eggs. Knowing this and knowing, further, that eggs are present in the dung and urine of infested pigs in enormous numbers, it must be obvious that so long as pigs are confined in small yards they will almost certainly become infested in some degree unless a very high standard of sanitation is maintained. Hence the necessity for regular collection and removal of dung, a drainage system that keeps the yards and sties as dry as possible, and the prevention of soiling of food and drinking water.

If freedom from worms is to be attained, it seems inevitable, under Queensland conditions, that at least so far as the average farmer is concerned, the semi-intensive system of raising pigs must give way to the paddock system.

Of the external parasites, lice are the commonest and are extremely prevalent throughout the State. Though farmers are generally quite conversant with measures to control them, the ill-effects arising from lice infestation are not fully realised and it is emphasised that the presence of lice is opposed to the production of thrifty and quick-growing pigs. They cause constant skin irritation and often, owing to scratching and rubbing, the skin becomes raw and may become infected. The ill-effects then become obvious, but it is the reduced rate of growth, due to continued irritation before the skin becomes raw and bleeding, that must be kept in mind.

Conclusions.

It seems to be a tradition amongst many farmers that pigs can be successfully raised amongst dirt and filth on any food that is offering no matter how sour or unbalanced it may be. Such an attitude is difficult to understand. It is certainly not correct and to the farmer who claims to get good results in such circumstances all that can be said is that the day will come when he will experience serious mortalities. Over and above this it can be stated with certainty that with improved management he would market a very much higher percentage of pigs born on the farm and at much better profit to himself. The average farmer would almost certainly be greatly surprised were he to keep accurate records of pigs born on the farm and pigs marketed as porkers or baconers. In some cases the latter would be barely 50 per cent.

Given a fraction of the attention and forethought accorded to the rearing of calves, foals, or lambs, the pig would more than hold his own. As it is, losses in the pig industry from disease are high. That this state of affairs is consequent upon mismanagement and not due to natural difficulties in the rearing of pigs, all farmers can easily prove for themselves.

It can be done, simply by affording the pig a greater share of consideration in the activities of the farm, as a whole, than it has hitherto enjoyed.

Setaria (Panicum).

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THE confusion that exists with both buyers and sellers of foxtail millet, because of the use of various names, most of which are not applied correctly, is unfortunate. The most common name used is "panicum"; this would seem to solve the matter easily, but for the fact that, botanically, this plant is a setaria, and belongs to the foxtail millet group, being so named from the appearance of the seed-heads.

The pre-war name—Hungarian millet—and the United States of America post-war name—Liberty millet—are often used.

German and Manchurian millets are yellow-grained setaria with different shaped seed-heads. Kursk millet, another variety, has red seeds, while brown-seeded forms are sometimes met with, in addition to which there are several wild forms with seeds of varying size, mostly yellow to green in colour.

The feeder of birds invariably asks for "panicum," and is not concerned as to the parent plant, but as to the seed being sound, clean, and free from musty smell.

From a series of experiments with samples of setaria from all over the State, it has been found possible to divide the foxtail millets grown in Queensland into—

(1) Early seeders of dwarf growth—Dwarf setaria (Hungarian millet).

(2) Late seeders of tall growth—Giant setaria (giant panicum).

Whether or not the plant is giant or dwarf setaria can best be determined by an examination of the plants when just over 3 inches in height. Dwarf setaria will be found to bear a profusion of hairs on the lower leaf sheath (Plate 83; figs. 1 and 1a).

Giant setaria has a freedom from such hairs (Plate 84; figs. 1 and 1a.) The hairs found on and near the ligule of dwarf setaria will also be found to be by far the longer; further, dwarf setaria is of a darker green than giant setaria.

It has been found that the presence or absence of the hairs is best observed when the roots are pointing away from the examiner.

Growing these two kinds of setaria side by side under various conditions of weather and soil, it will be found that there is always approximately two weeks difference in maturity.

The conditions of growth affect the appearance of the resultant crop so much that the tallest of the dwarf varieties, under favourable conditions, would equal the height and appearance of the shortest of the giant varieties under dry conditions. Also, the size of the seed-head would be similarly affected.

All forms of foxtail millet are quick growers, and it must not be overlooked that the highest feeding value is obtained from the leaf in its young stages, and not from stalks or stems. With the dwarf, irrespective of the weather conditions, the plants always have the

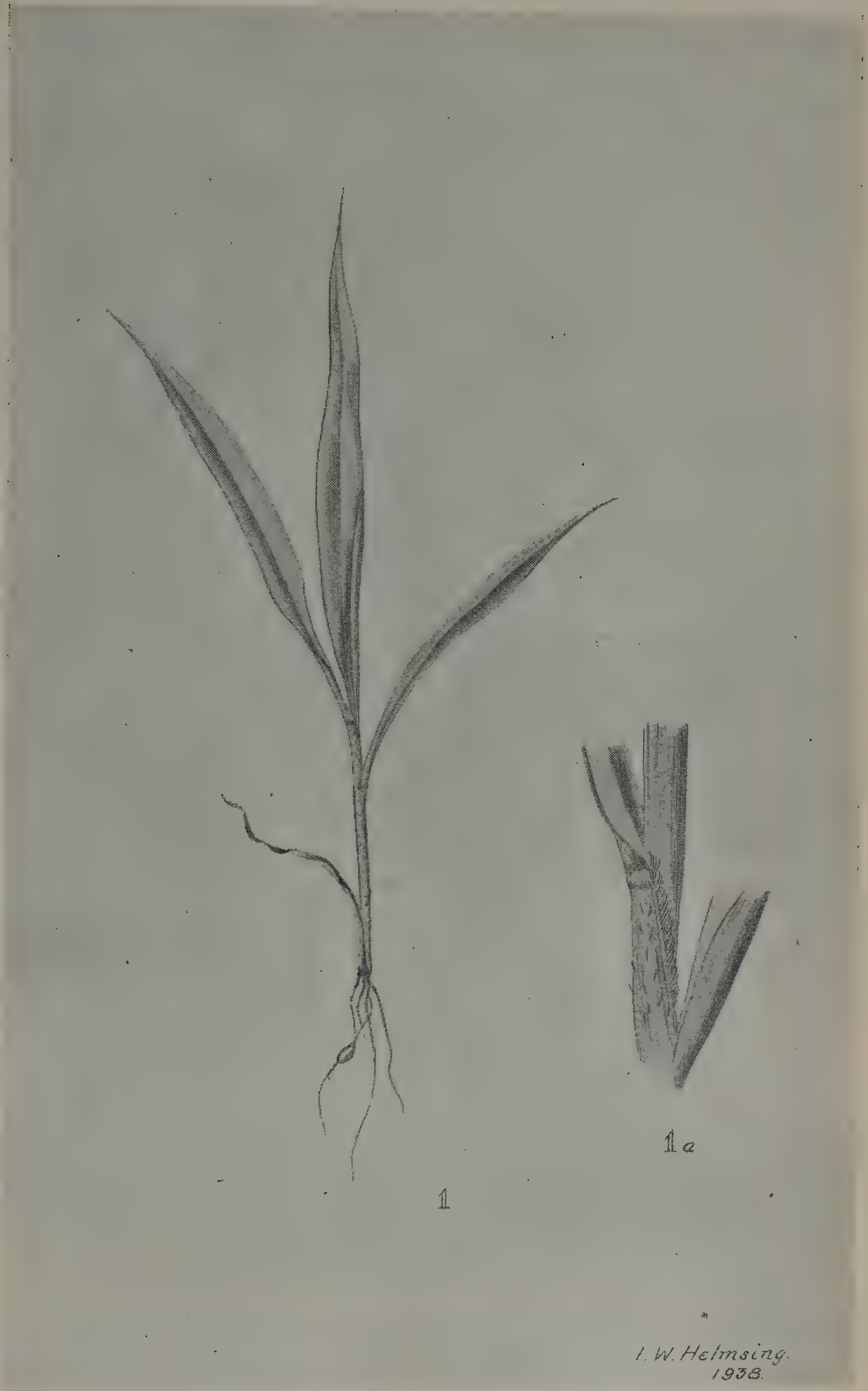


Plate 83.

Dwarf Setaria (Hungarian Millet).—Fig. 1: Seedling. Fig. 1a: Lower leaf sheath showing profusion of hairs.

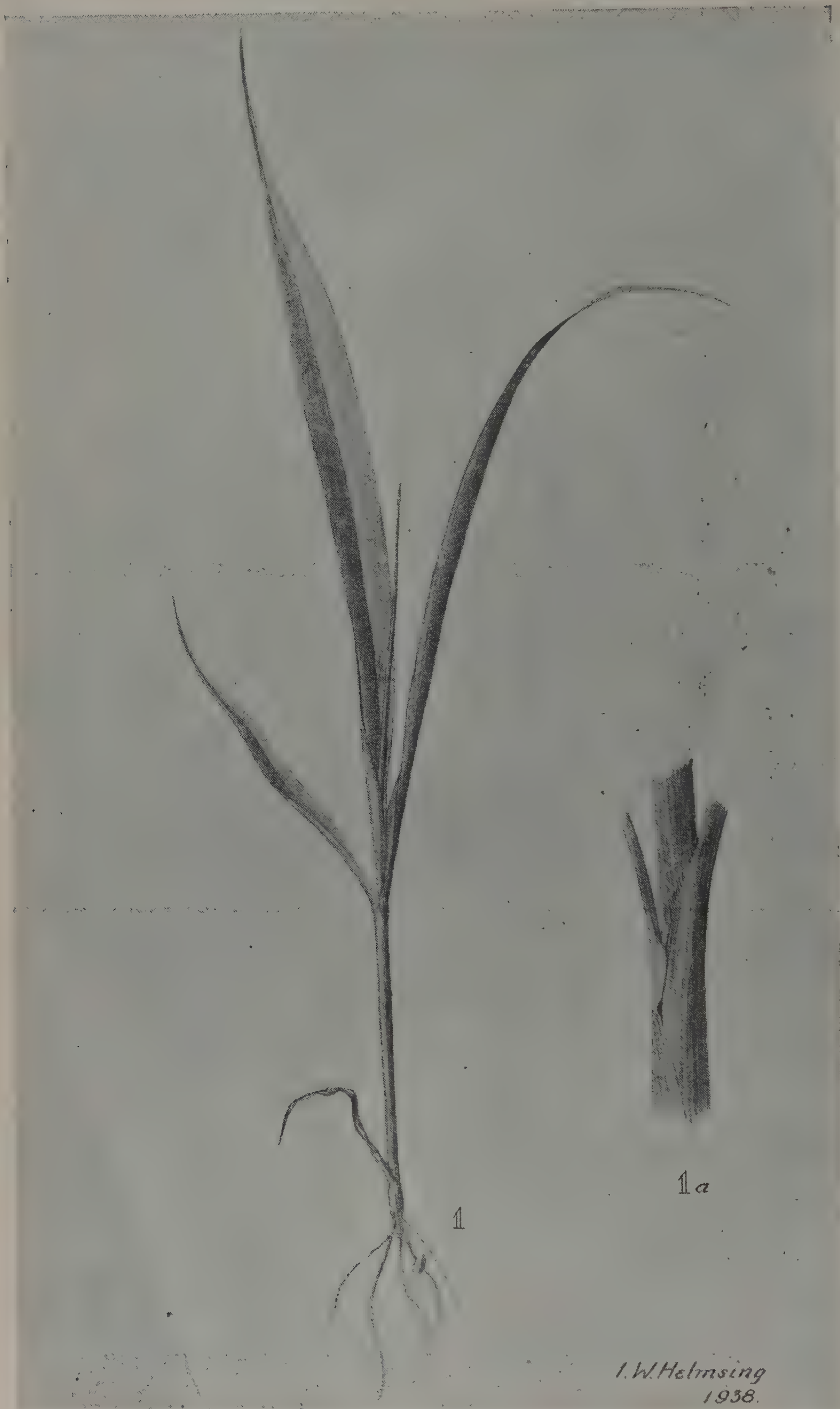


Plate 84.

GIANT SETARIA (Giant Panicum).—Fig. 1: Seedling. Fig. 1a: Lower leaf sheath showing meagre distribution of hairs.

A. B. C. D. E.

Plate 85.

A. Dwarf Setaria (Hungarian Millet).
B. Giant Setaria (Giant Panicum).
C. White Panicum.
D. Japanese Millet.
E. White French Millet.

1 1a

Plate 86.
Giant Setaria (Giant Panicum).
Dwarf Setaria (Hungarian Millet).

tendency to rush into seed-head. If the farmer desires to grow setaria seed for sale as bird feed, his preference should be for the giant setaria, which produces a far heavier yield of seed. Repeated trials have demonstrated that the yields of the dwarf and giant varieties are in the ratio of 11 to 17.

Apart from the heavier seed yield of the giant, it should be recognised that this variety is of better feeding value than the dwarf—another instance of the nutritive value of leaves, not stems.

Some people have expressed their ability to determine by the size and shape of the seed the identity of any sample. Experience extending over a large number of samples indicates that this method is far from perfect, and therefore one should use the longer method as indicated above.

A comparison of the different millets grown in Queensland is indicated in Plate No. 85—from a photograph taken seven weeks after sowing of the seed.

The dwarf setaria (Hungarian millet), Japanese millet, and white French millet have reached maturity, while the giant setaria (giant panicum) and white panicum took two and a-half weeks and more to attain the same stage of development.

GOOD SEEDS.

Although nearly everyone will agree that better seeds mean better crops, it must not be overlooked that better cultivation means better seeds.

Seeds to be good must have a high germinating capacity, be true to variety name, and free from weed seeds, inert matter, and disease or insect infestation. No matter how careful the grower may be, all crops will contain some plants other than those which it is intended to produce. A cleaning machine should, therefore, be used before the seed is offered for sale. In Queensland, as in every other part of the world, the most critical buyers will be found among the merchants with efficient cleaning machinery.

A modern seed-cleaning plant can make good samples of uncleaned seeds better, but it cannot make bad samples good. With a full knowledge of their machinery possibilities, most merchants are willing to buy on a clean seed basis. They are not, however, inclined to purchase poor samples, and the usual market for seeds of indifferent quality is with dealers who have little appreciation of impurities. The actual seed user who insists on buying his supply on a price rather than on a quality basis encourages the vendors of goods of inferior quality. Unfortunately, seeds of indifferent quality usually carry a large profit to the seller.

Good seeds cost money to produce and money to clean, and the general improvement of farm seeds rests largely with the farmers themselves. When practically every farmer insists on a high-grade product the demand for poor-quality seeds will cease. Only the best-quality seeds are worth buying.

—*F. B. Coleman.*

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture, and Chief Inspector of the Banana Industry Protection Board.

[*Continued from page* 125, *February*, 1938.]

CULTIVATION.

GENERALLY, the rough nature of most banana plantations in Queensland precludes the use of horse-drawn implements, and cultivation and weed control has to be done by hand with a hoe. In rich, deep, and friable soils little else is required, the suppression of weed growth being the chief object. In this class of country, five hoeings or chippings in the first year are usually necessary, while in the second year four should be sufficient. After the second year chipping becomes much lighter, provided the weed growth has not been allowed to seed. The estimated cost of chipping a plantation for the first and second years at, say, £3 an acre for each chipping is from £27 to £30 an acre.

Where the land is of a tighter nature, simply scraping the surface, which is all a chipping hoe does, is not sufficient. This class of country—embracing the light-coloured soils of the pine scrubs, some lantana country, and all hardwood forest soils—needs digging at least once a year, breaking up the soil to a depth of 6 inches or more. This controls erosion, conserves moisture, and in every way enables the plants to make better growth. Provided the land is not too stony, no better tool could be used for this work than a four-pronged hoe. In the trade these are called vine hoes and are sold with the prongs about 10 inches long, but it pays to have them cut back to 8 inches and to use a shorter handle than in an ordinary chipping hoe. There is something of an art in using the vine hoe properly. It should be driven into the soil almost to the eye, the handle canted slightly, and then pulled towards the operator. This action turns the sod completely over, burying all weed growth, trash, &c., in a way similar to the mouldboard or disc of a plough. A loose and roughened soil surface will result—an advantage providing ample aeration, preventing erosion, and satisfactorily covering all vegetative matter so necessary in building up the humus content. Where the land is too stony for using this tool, a long-bladed mattock is recommended.

For dealing with the weeds during the rest of the year, the usual chipping hoe (sizes 4 inches wide in stony country and 7 inches wide in land carrying few or no "floaters") will be found quite satisfactory.

Many growers favour the use of poison sprays for weed control, and experience has shown that arsenic-pentoxide used at the rate of 1 lb. to 4 gallons of water plus 2 oz. of phenyle (as a spreader) will give satisfaction, provided the growth consists more or less of a soft weed type, and that spraying is used only as a temporary measure of control. Spraying is recommended only (1) where abundance of water is readily available, as approximately 80 gallons of spray are required to the acre; (2) where it is necessary to immediately prevent weeds from seeding (a man accustomed to this work can spray an acre a day with reasonable ease); and (3) where a crop of young weeds appears

Plate 87.

A properly cultivated twelve-months-old Vie Mama plantation at Upper Mudgeeraba. Only hand cultivation is possible in this class of country.

Plate 88.
Sugar bananas, Bundaberg district. One of the few plantations in Queensland where horse cultivation is practicable.

Plate 89.
Typical of most banana plantations in Queensland. Cultivating all done by hand. Note stony nature of the surface of the ground, which is in no way detrimental.

within a few weeks of *the first spraying,* and where, by destroying this growth, practically all the viable weed seed in the plantation becomes exhausted.

Two sprayings applied at intervals of approximately one month should be followed by a good chipping, for even though the soil may be rich in quality, some cultivation, if only 2 or 3 inches deep, is necessary.

Points to be remembered are:—The chipping hoe must always be kept sharp. Do not chip from plant to plant across the hill when working up between the rows. This has the very detrimental effect of dragging the soil away from beneath the stools, thus baring the roots and weakening the stools on the lower side. It is far better to make the row of plants the centre of the row that is being chipped, thus naturally allowing the soil to be drawn in under the lower side of the stool, as against building up the centre of the rows, which is the case when one chips a strip from plant to plant. By this method much work is saved in later years through avoiding the necessity of building up the downhill side of a row of plants in a hillside plantation.

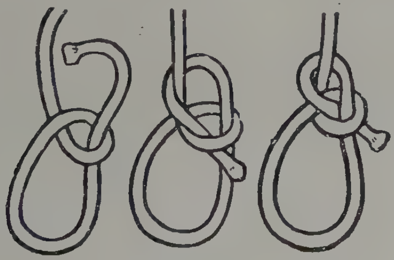
Banana chippers should always carry a sheath knife. Chip the row of plants first, and on the return journey—i.e., from the top of the row just finished down to the commencement of the next row—remove the trash from the plants just chipped, thus completing the job of cleaning up the plantation in one act.

Some growers use home-made bush hoe-handles, but when the time spent in shaping a young sapling into something like a presentable and usable handle is considered, the effort is scarcely worth while. Machine-turned hoe-handles can be bought for about 1s. 3d. each. Seven-inch all-steel chipping hoes are worth 3s. 4d. each, while 4-inch hoes are slightly cheaper. A forked vine hoe as recommended is a necessity on almost every banana plantation, and is worth 5s. 3d.

[TO BE CONTINUED.]

A KNOT TO KNOW.

"Enquirer" (Moggill).—This is how the bowline knot is made:—



I. II. III.

Plate 90.

The bowline, used when a loop is necessary at the end of a rope, is made by forming a loop in an anti-clockwise direction by placing the end of the rope over the standing part. Pass the end up through the loop formed (Fig. I.) under and around the standing part on a clockwise direction and take through the loop (Fig. II.). To tighten, hold the end of the rope and one side of the newly-formed loop and pull the standing part.

Forestry in Queensland.

LAST year was a record one in Queensland forestry. The total log cut from Crown lands, nearly 162,000,000 superficial feet, the largest annual cut yet recorded, exceeded the best previous figure (in 1935-36) by over 13,000,000 superficial feet, and represented approximately 63 per cent. of the total log cut of the State.

Because of the increasing demand for Crown supplies, it has been found necessary to increase the road construction programme, not only to make further timber stands available, but also to speed up the rate of delivery by mechanical haulage.

It has been found possible to concentrate still further on the urgent work of the improvement, protection, and regeneration of natural hardwood and cypress pine areas. The main feature of the year's work has been the great improvement in the forest fire protection system, some 600,000 acres now being within the fireline system. Some 932 miles of new firebreaks were prepared, a further 950 miles maintained, whilst 110 miles of telephone were constructed, and twenty fire lookouts are now in operation. Despite an exceptionally bad fire season last year, a surprisingly small portion of the protected area was burned over, and it is expected that even better results will be achieved in future.

The improvement and regeneration treatment covered 41,700 acres of forest not previously under management, making 110,750 acres so treated for the past three years, an area in excess of the total of the previous ten years' operations.

Despite the very dry conditions, excellent establishment figures were recorded in the plantation operations.

Good progress has been made during the past three years, during which period over 35 per cent. of the present planted area of 17,000 acres has been established.

The more sympathetic consideration accorded to reforestation work during the last five years must be acknowledged.

In order, however, to produce a sustained yield equal to the pine cut of last year, an area of pine plantations six or seven times the present area would be required, and very valuable reproductive work could be performed, by increasing the rate of replanting the hoop pine lands as they are cut out of virgin timber.

The past year marked the initiation of an active policy of development and protection of the national parks, with the object of making the recreational and educational values of the parks more readily available to the public. It is felt that a more intensive development of our parks would not only enable our people to enjoy these areas more fully, but would also materially assist our expanding tourist industry.

The full story of recent forestry development in the State is contained in the annual report of the Director of Forests, Mr. V. Grenning, through whose courtesy we are able to reproduce a series of pictures which illustrate to some extent the wealth of the timber lands of Queensland.

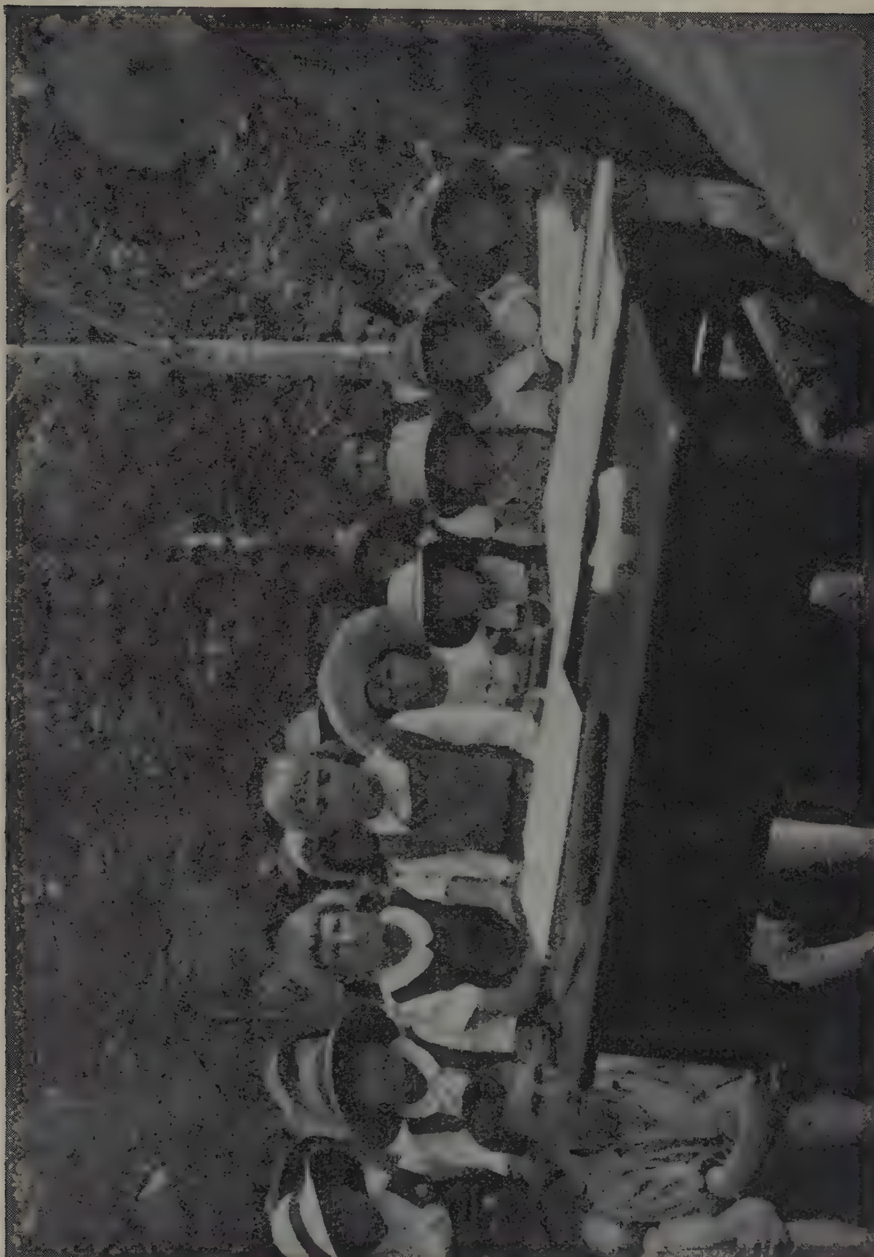


Plate 91. [*Photo. Education Dept.*

THE YOUNG PRESIDENT OF A FORESTRY CLUB ADDRESSING CHILDREN IN A SCHOOL FOREST PLOT.—During the year trees were supplied for fifteen new school plots. Seventy-four plots have now been established.

Plate 92.

[*Photo. J. A. Lunn.*

QUEENSLAND MAPLE SEEDLINGS IN FOREST NURSERY.—1,300,000 trees were set out in plantations and 4,600,000 trees remained in nurseries at the end of June.

Plate 93. [Photo. J. A. Lunn.

ROAD TO KIRRAMA STATE FOREST UNDER CONSTRUCTION.—The sum of £85,774 was expended during the year on Forestry Access Roads.

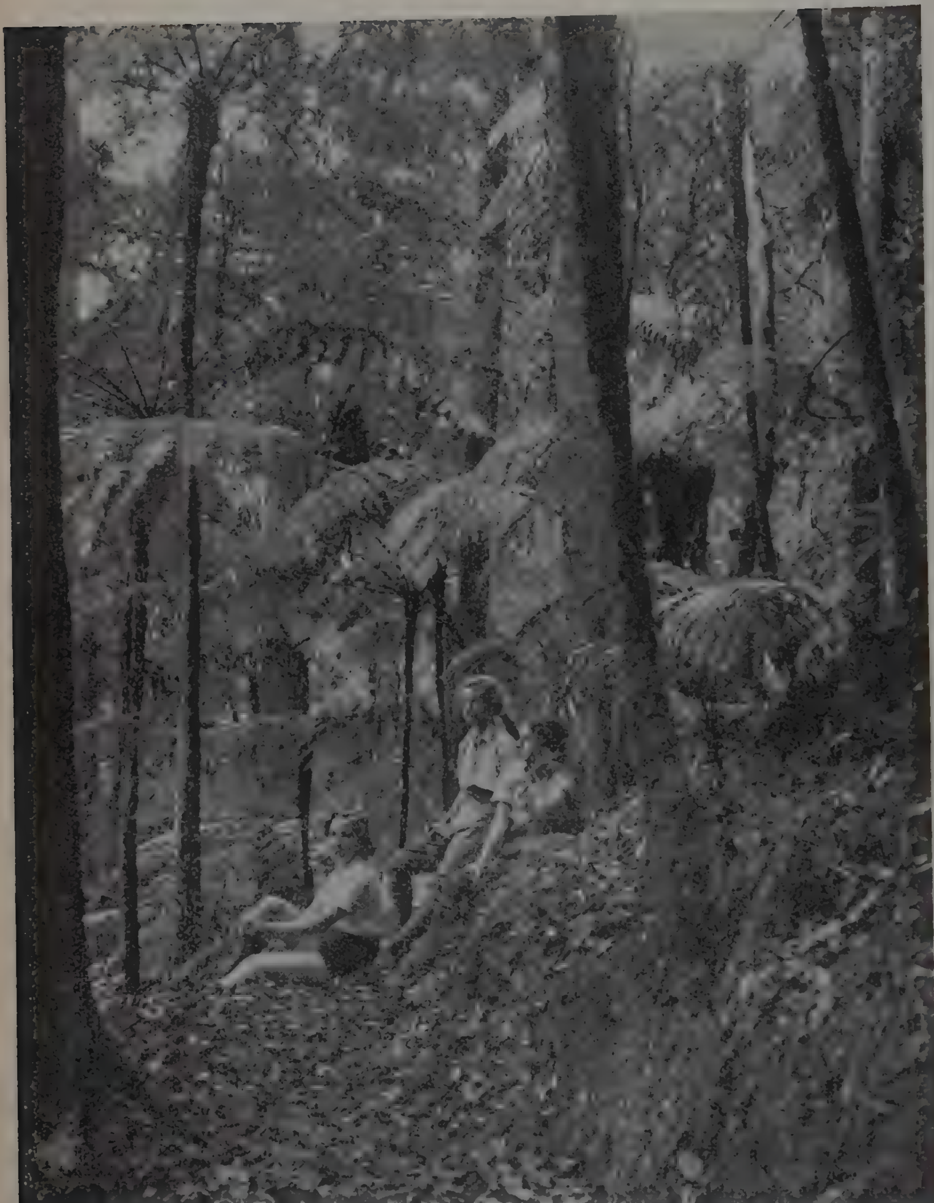


Plate 94. [*Photo. G. S. R. Gentry.*

GRADED WALKING TRACK, LAMINGTON NATIONAL PARK.—The past year marked the initiation of developmental work in national parks in Queensland.

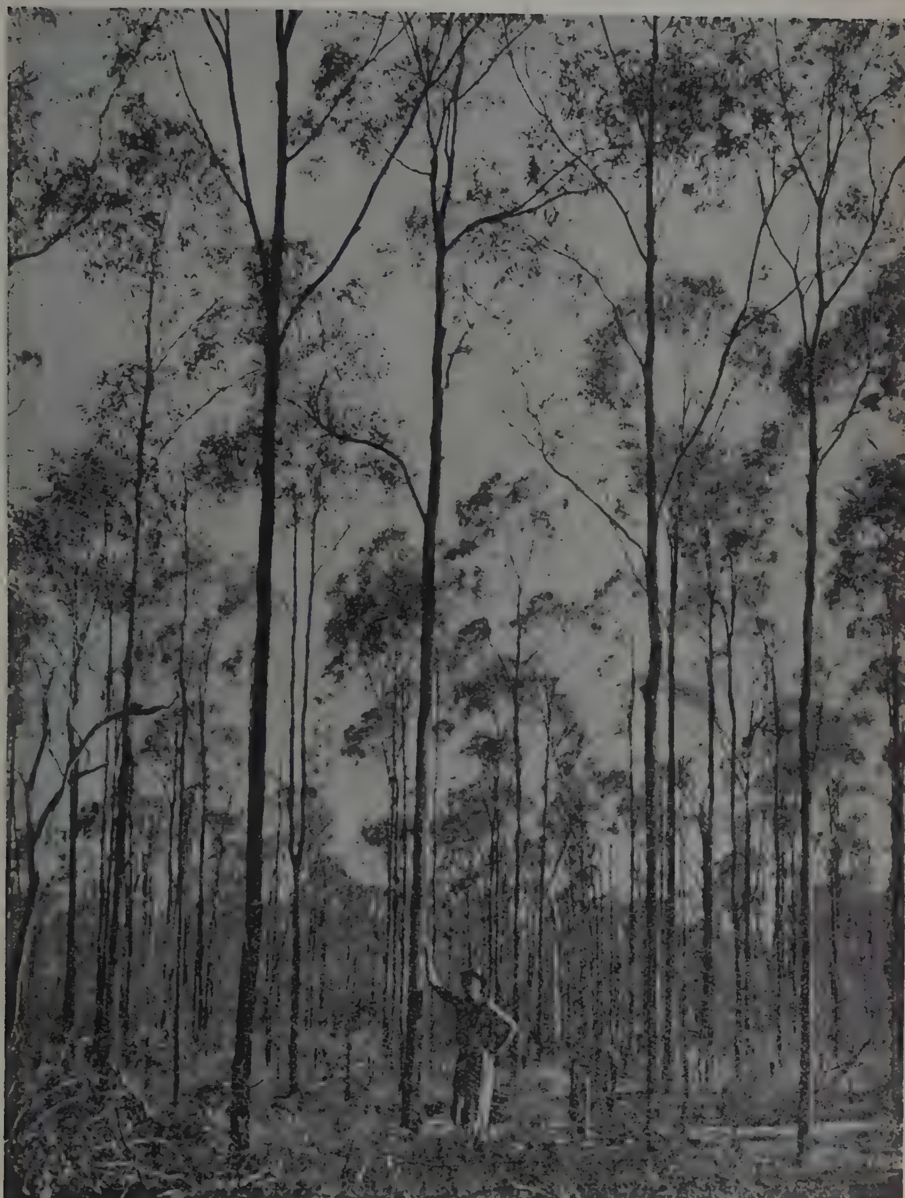


Plate 95. [*Photo. S. G. Jennings.*

A Stand of Narrow Leaf Ironbark after Thinning.

Plate 96. [Photo. J. A. Lunn.

TREATED POLE STAND OF WESTERN CYPRESS PINE.—During 1936-37, 52,305 acres of natural hardwood and cypress pine forest were subjected to an improvement thinning and regeneration treatment.

Plate 97.

[*Photo. J. A. Lunn.*

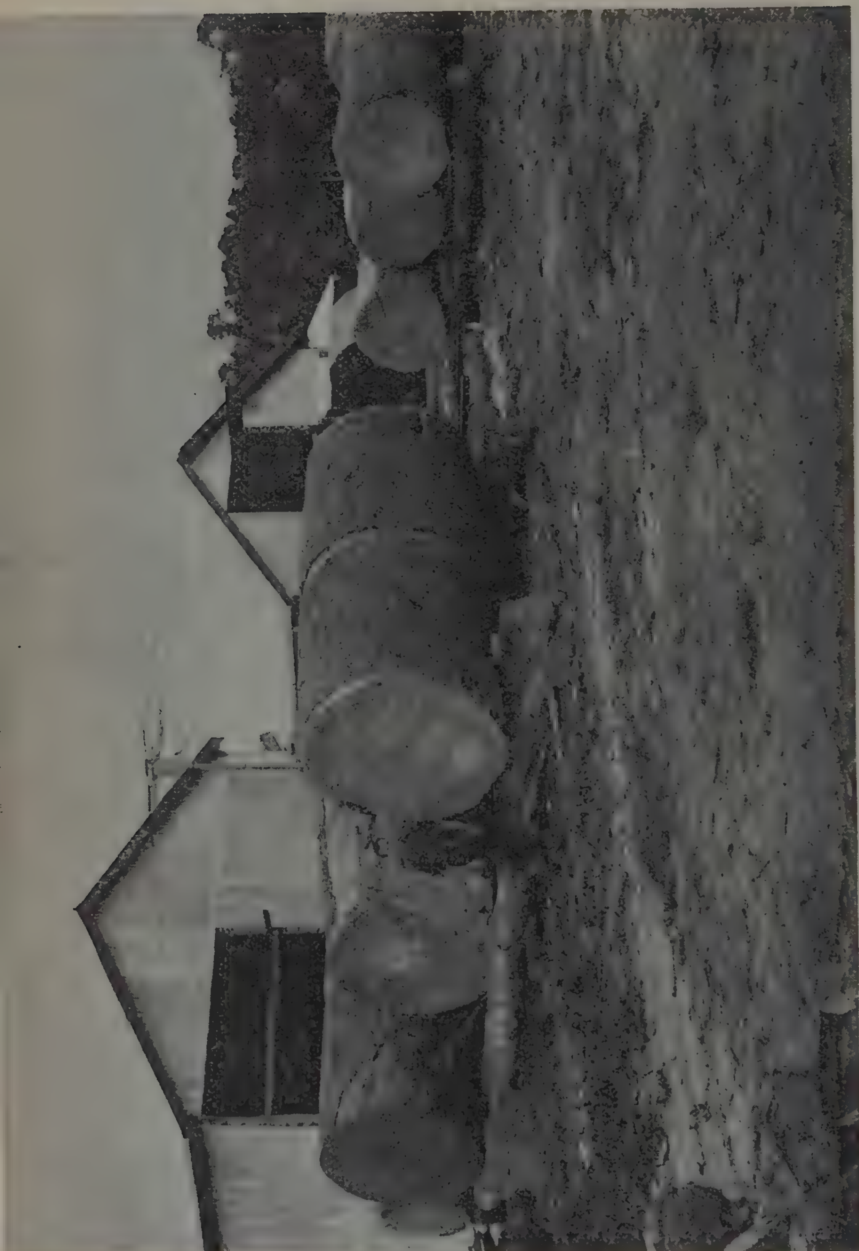
FIRELINE AND ACCESS TRACK IN A CYPRESS PINE FOREST.—932 miles of firelines were constructed and 951 miles maintained during the year.

Plate 98. [*Photo. S. G. Jennings.*

FIRE LOOKOUT.—Six Lookout Stations were established during the past year.

Plate 99. [*Photo. by J. Reis, Yungaburra.*

LOGGING KAURI PINE IN NORTH QUEENSLAND.—The record quantity of 161,900,000 superficial feet of logs was cut from Crown lands during the year.



[*Photo. J. A. Lunn.*

Plate 100.

KAURI PINE LOGS AT A NORTH QUEENSLAND PLYWOOD MILL.—For 1936-37 season, 630 mills cut 260,000,000 superficial feet of logs.

A Good Type of Haystack.

LLOYD HODGE, Manager, Cotton Research Station, Biloela.

SECURE stacking of hay and its protection from the weather are matters of great importance in fodder conservation. In Queensland protection cannot be guaranteed by an ordinary straw thatch. A roof of galvanized iron, although initially more expensive, gives perfect security against the heaviest of rains, and is, all things considered, recommended as the most suitable material for the purpose.

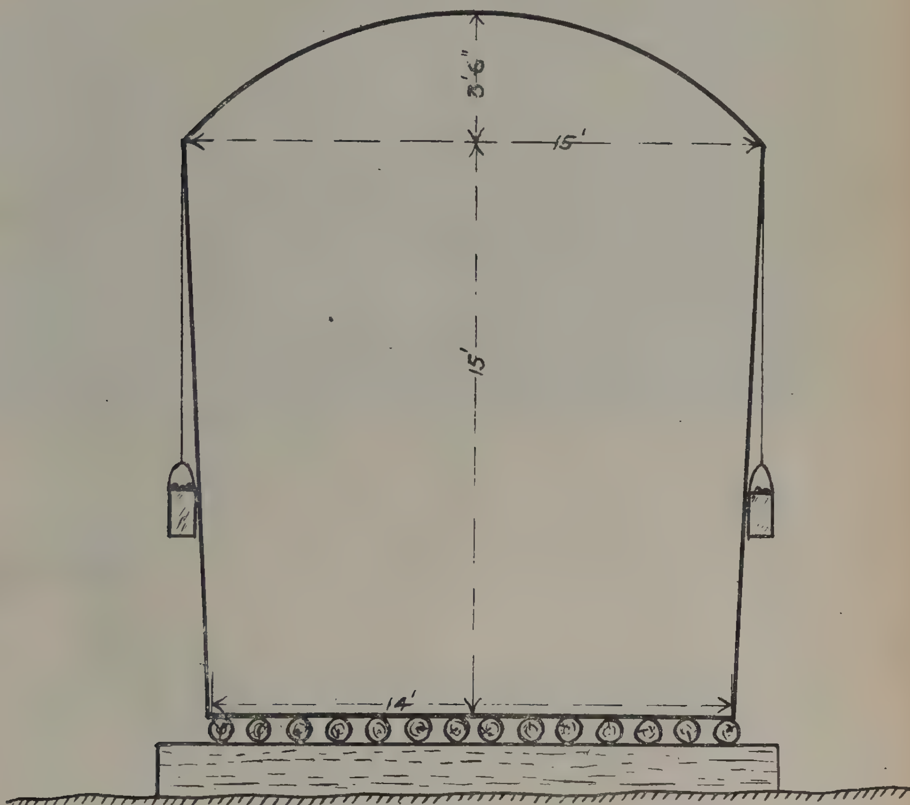


Plate 101.

Galvanized iron, curved to various degrees, and tried in several lengths, was brought into use at the Queensland Agricultural High School and College, near Gatton, some years ago, and was proved to be practical and convenient for roofing haystacks.

The Cotton Research Station at Biloela, after several trials, finally adopted a standard which has given very satisfactory results. This stack is shown in section in Plate 101. The floor is made of 12-inch diameter hardwood logs, laid crosswise at 5 feet apart; upon these, hardwood sapling poles at an average of 6 inches apart are placed lengthwise. The stack is roofed with curved, 24-gauge corrugated

galvanized iron. The curve is formed by bolting two 10-foot sheets, each machine-curved to a 12-inch spring, together end on end. This forms an arch with a span of approximately 15 feet, with a height of 3 feet 6 inches.

Capacity and Cost.

On the design shown in Plate 101, an estimate of 1 ton of hay to each foot in length will be found to be accurate enough for practical purposes, but because of fire risk it is not recommended to build single stacks of over 60 tons.

The same type of roof may be used to cover small cuts of hay quite conveniently, by lowering the height.

Iron requirements for a stack of the section shown may be considered to be one sheet for each ton of hay.

The cost of galvanized iron fluctuates slightly, but is generally about 6s. 6d. a sheet for 10 feet x 24-gauge, and 5s. for the same length in 26-gauge. Curving costs 5d. a sheet. Galvanized roofing bolts ($\frac{1}{4}$ inch by $1\frac{1}{4}$ inch) are used to join the sheets—three bolts to a sheet—and cost 5d. a dozen, or approximately 2d. a sheet.

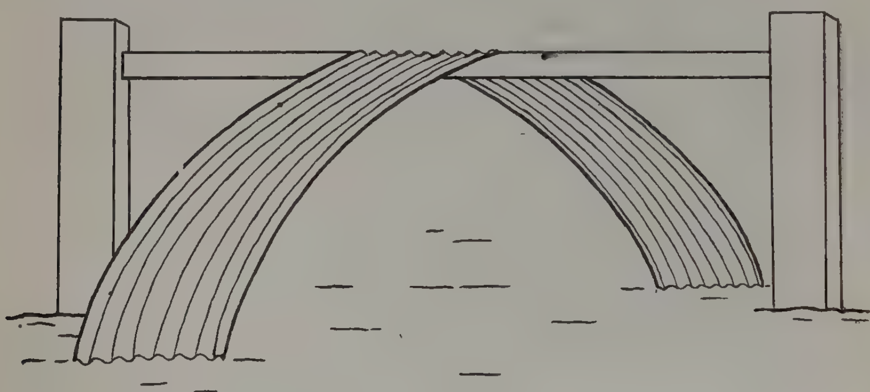


Plate 102.

The cost for material, therefore, is:—

	24-gauge.	26-gauge.
	s. d.	s. d.
10-foot Sheet	6 6	5 0
Curving	0 5	0 5
Bolts	0 2	0 2
	7 1	5 7 a ton of hay.

Freight, of course, is additional.

On a 50-ton stack a saving of £3 15s. could be made by using 26-gauge iron, but the 24-gauge is worth the extra cost, because of its extra strength and durability and the additional stability given by its weight. Allowing for freight and other incidentals, the cost of roofing a 50-ton stack in this way would be practically £20, or 8s. per ton.

From an insurance point of view, on a 50-ton stack opened up after five years, at a drought valuation of £10 per ton, the £20 spent on the roof amounts to an annual premium at the rate of 16s. per £100, the iron remaining as a permanent asset.

Construction.

When ordering the iron, it is better to have every sheet curved the one way, so that the edges are down, as it is easier to put on. It is necessary to punch the bolt holes and assemble the roof on the ground before it is built on to the stack.

Plate 103.

A 50-TON HAYSTACK ROOFED WITH CURVED CORRUGATED IRON.—Note how snugly the roof has settled down, giving perfect security during the heaviest rains. When it is desired to open the stack, all that is necessary is to unbolt the last two, four, or as many sheets as cover the quantity of hay required, the remainder being secure and undisturbed.

A convenient stand for this may be made by fixing a stout rail (stout enough not to bend) parallel to a level piece of ground, at a height of 3 feet 6 inches, and long enough to carry three pairs of sheets bolted together, and to leave a few feet over at either end for working room—say, about 12 feet long. The pairs are then bolted together as shown in Plate 102.

When three pairs have been assembled the rear (or first) pair is unbolted, and the sheets are numbered 1 and 1A, care being taken that the lettered figure is always on the same side.

Another pair is then fitted to the working edge, and the same procedure gone through until the whole roof has been assembled, numbered, and taken apart ready for building on top of the stack.

When fitting, a 6-inch overlap is given at the top of the arch. Three bolts hold this join, the outside ones also holding the overlap of the neighbouring pairs. Two additional bolts are inserted down each side of each 10-foot sheet, so that each complete arch is joined to its neighbour by five bolts. It is wise to allow generous holes when

punching, for if they are too neat it is difficult to pass the bolts through the several thicknesses of iron when building upon the yielding hay.

The prepared sheets are hauled up singly in a suitable rope sling, and the builder bolts the first pair together with the outside and centre bolts at the top of the arch. He then joins the next pair by the centre bolt only, before joining the set to its neighbour.

Two men are able to do the work, but a third to assist the builder on the stack makes the work much easier—chiefly by holding the sheets in place as the bolts are inserted.

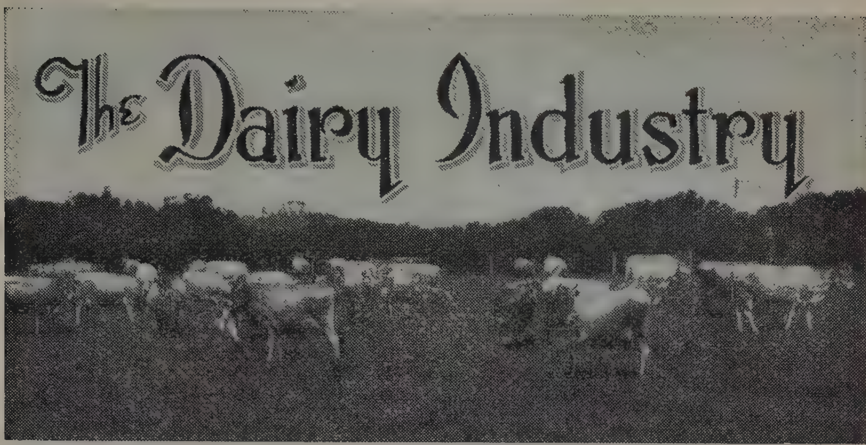
Plate 104.

A line of lucerne haystacks inadequately protected from the weather. A roof of iron on each stack, as described in the text, would have prevented deterioration, which has already set in.

Securing the Roof.

It is as well to secure the roof temporarily against wind as it is being built, for it is easily dislodged when simply lying upon the top of the stack. When completed, a permanent anchorage should be provided—a job calling for care and thoroughness.

Cables consisting of single stands of No. 8 galvanized fencing wire should be passed right over the roof in the middle of every alternate pair of sheets. On no account is it advisable to pierce the iron at the edges and attach the wire in that way, for it will tear out in a hard blow. Convenient weights—such as logs, or kerosene tin buckets filled with stones—are suspended from the ends of the wires, sufficiently high to allow for settlement of the stack. Additional rigidity may be necessary in windy localities, and is conveniently given by bolting a 3-inch by 1-inch hardwood batten 6 inches up, along the edges of the roof. It is an additional safeguard to pass an extra wire over the two end pairs of sheets and secure them to the bed logs; these should be kept tightened as the stack settles.



Variations in Cream Tests.

F. C. COLEMAN, Dairy Branch.

BUTTER factory staffs are often blamed unfairly for variations in cream tests. The efficiency and proper control of a factory depend upon the accuracy of cream weights and tests, careful and scientific control of moisture tests, exactness in weights of butter packed, &c. No certificated tester can afford to jeopardise his certificate by wrongfully testing a farmer's cream. These facts should always be carefully weighed before complaints are made against a factory management.

The cause of a drop in the cream test should first be looked for on the farm. The dairy farmer should ask himself if conditions in the herd and the dairy could have caused a change in the tests of his cows, or if the milk was separated as it should have been.

A misconception exists that if the cream screw of the separator is set to give a definite thickness of cream, the correct speed maintained, the temperature of the milk, the rate of inflow, and all other things being equal, then the test of the cream should not vary.

The setting of the cream screw was not meant to give a fixed percentage of fat in the cream. What it does do is to regulate and fix the ratio of cream to skim milk, and any alteration of the screw has a corresponding influence on the ratio.

Let us suppose that this ratio is 90 to 10, meaning that for every 100 lb. of milk separated 10 lb. is cream and 90 lb. is skim milk, and that the test of the bulk milk which is being separated is 4 per cent.; then the test of the cream will be 40 per cent.

Later on, a change may occur in the cream fat content of the herd milk. This may be due to several things, such as the lactation period or a change in the normal interval between milking. We will assume that it now tests 3·5 per cent. The cream screw has remained unaltered and the ratio is still 90 to 10, but the test of the cream will now be 35 per cent.

Providing that the conditions of separating remain always the same, and despite the fact that the richness of the milk is ever fluctuating, this ratio of skim milk to cream should remain constant.

If the milk is poor in fat the separator discharges 90 lb. skim milk and 10 lb. cream; should it be rich, this proportion still remains the same, but as the efficient modern separator allows practically all the butter fat to go into the cream, it should be obvious that cream from rich milk will test higher than that from poor milk.

CLEAN MILK IN HOT WEATHER.

At this season of the year, the problem of keeping milk from souring requires a little extra attention. Bacteria thrive at midsummer temperatures and cause milk to sour and lower the butter-making qualities of the cream. Chief among the measures of defence against the souring of milk are cleanliness and cooling—i.e., low temperature. It is not enough to draw the milk in a clean way; utensils must be clean to the point of being practically free from souring bacteria. In addition, milk must be cooled immediately if its quality is to be preserved long enough to permit its reaching the consumer in an acceptable condition.

Milk sours very quickly at high temperatures. This, however, is not the only cause of the souring of a lot of summer milk. Mudholes, manure heaps, swamps, and the muddy banks of streams in the grazing paddocks help to deposit a considerable number of bacteria on the teats, udders, and adjacent parts of the cows. The bacteria which gain entrance to the milk at the time it is drawn and in course of conveyance to the cans for temporary storage or for immediate delivery have a lot to do with the time required for souring.

If the customer should complain of sour milk in the warm weather, and should the cooling of the milk fail to remedy this defect, then all possible sources of contamination should be investigated. In some cases, this will be found coming from the filth of muddy places, or the dust of dry manure.

With sterile utensils and rapid cooling, a low bacterial count may reasonably be expected; likewise the complete elimination of rejected supplies, higher quality milk, and, consequently, greater profits.

—*L. W. B. Verney.*

THE VALUE OF ANIMAL MANURE.

The unused dung of farm animals in Queensland must represent a great loss of national wealth each year. On almost every dairy farm one can see this waste, from the freshly voided piles round the milking yards to last year's undisturbed cake lying bleached and useless in the field.

Idle dung is not only idle money; it is wasted money. About four-fifths of the food consumed by farm animals is excreted, and the fertilizing constituents of this manure are equal pound for pound to the best obtainable.

The urine soaks into the earth and soon makes its nutrients available to the plant roots, but the dung lies on the surface and if left unbroken may take years to decompose.

The direct results of this condition are readily observed. A definite area is temporarily spoiled for grazing, and when eventually grass grows around or through the heap it is completely ignored by stock until there is nothing else left. By this time it has aged, become harsh, and lost much of its nutritive value.

The indirect results are not usually recognised. Rats and other vehicles of disease revel in droppings and transfer any infection to feed bins, troughs, and stored foods.

These disadvantages can not only be eliminated, but, by using a proper system of conservation and distribution, be converted to profit.

The material which accumulates in sties and stalls or where animals congregate can be readily collected and tipped into a nearby excavation. The excavated earth can be banked to form a run-off. A covering of palings, old posts, sheets of iron or other suitable material should be used to avoid trouble to stock and inconvenience to farm workers. Manure stored and covered in this way loses little of its fertilizing value. Manure piled in the open and exposed to the weather loses much by fermentation and leaching.

When land is to be manured the pit can be opened and the material removed.

Where the paddocks are large and the droppings widely distributed a system of conservation is not practicable. In such cases periodic visits should be made with a rake and the dung under shade trees, around watering places, or along "pads" broken up and scattered. This allows the material to dry quickly and continuous tramping by stock soon works it into the soil.

The benefits derived from farm manure are twofold. It supplies plant nutrients as well as an excellent medium for the production of humus—the organic water-conserving colloid of soil.

The daily production of dung per 1,000 lb. live weight is approximately:—

Cow	52 lb.
Horse	40 „
Pig	50 „

This means that on a farm running 35 cows, 4 horses, and 4 sows there would be a weekly production of 6 tons. If only one-third of this could be collected it represents at least 100 tons of good fertilizer each year.

THE IMPORTANCE OF THE SEPARATOR FLOAT.

Probably the most neglected part of the separator is the float, the function of which is to regulate the flow of milk into the bowl.

This means that it should be perfectly balanced, otherwise an irregular flow occurs and inefficient separation and fluctuation of tests result.

It has been frequently found that floats are badly dented or leaking. To this condition is added the danger of throwing the float out of balance by unskilful repairs. It has also been found that leaking floats have been repaired without first emptying them, which makes them heavier than designed.

Probably the most serious aspect of damaged floats is the fact that cracks and badly soldered joints provide just the right conditions for the growth of bacteria. Consequently, milk passing over them becomes contaminated, resulting in many cases of cream being graded down.

Dairymen would be well advised to give consideration to this matter, and when repairs are necessary to have them done by a competent tradesman, who should be advised of the importance of the work.

—*S. E. Pegg.*

BLIGHT IN CATTLE.

It is safe to assume that blight in cattle will again become prevalent in the coastal areas of the State during the wet season.

This is a highly contagious complaint, and, apart from losing condition, many animals become blind. Treatment should be applied as soon as the trouble is noticed.

The following solution is very useful in treating the complaint:—

Nitrate of silver	3 grains
Sulphate of morphia	1 grain
Soft water	1 ounce

An alternative and less expensive remedy is a mixture of 2 per cent. zinc sulphate and 2 per cent. boracic acid in water that has been boiled.

All eye discharges should be washed from the face of the beast and vaseline applied to the area covered. The discharges attract flies; while flies continue to irritate the animal a cure will be long delayed, if not prevented entirely.

The affected eyes should be syringed in the early morning and late afternoon. A small bulb syringe is quite suitable for applying the solution.

Marketing Pigs.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

PORKERS should be marketed at an age and weight to suit export market conditions, as well as the local trade. Best trade weights, for prime-conditioned pigs, range between 60 lb. and 90 lb. dressed (approximately 95 lb. to 139 lb. live weight). For local markets, the best range is 60 lb. to 80 lb. dressed weight (95 lb. to 130 lb. live weight). Porkers should be in good condition, free from bruises, whip marks or other faults, and be protected from the effects of severe heat; otherwise, they will not dress out to advantage on slaughter. Lighter weights and very thin pigs are not profitable as porkers, and at factories and meatworks will only be paid for at valuation.

Bacon pigs for local markets should be 90 lb. to 130 lb. dressed weight (approximately 140 lb. to 185 lb. live weight), with added range to 160 lb. dressed weight (220 lb. live weight) at slightly lower rate per lb. dressed. For export, the range of weights varies from 120 lb. dressed weight (175 lb. live weight) to 160 lb. dressed weight (220 lb. live weight), but the heavier pigs should not carry too much fat; otherwise, they are subject to reduction in price or to rejection. For local markets also, there is a strict limitation to the percentage of fat, and factories prefer pigs in meaty condition with only a light covering of fat.

Sows for smallgoods trade should be in good condition, and should have weaned their litters two months or more before marketing; also, they should not be in pig any more than one month, if in pig at all. Sows close to farrowing and those farrowed recently are liable to condemnation at the factories. Poor brood sows and poor stags are useless and will not be accepted, while boar pigs are useless for meat purposes until castrated, and then well fed for approximately two months, the time depending on the progress made after the operation

In every instance the greatest care should be taken to avoid bruising and damaging the pigs in transit, especially when loading and unloading.

Pigs carted to country sidings for trucking or sale should not be fed immediately before despatch, as such feeding is conducive to heavier shrinkage and to digestive disorders in transit.

It is again emphasised that under the Queensland Pig Industry Act all pigs must be branded by the vendor before sale, barter, or exchange. Full information on any of these points is obtainable from the Department of Agriculture and Stock, Brisbane.

MAIZE AND PORK QUALITY.

Owing to its relatively high fat content and the low melting point of its fat, maize can be responsible for the production of soft fat in pork and bacon.

A sweeping statement is sometimes made that "maize-fed" pigs are soft as compared with pigs which have been fed on wheat or barley. The statement really needs some qualification so far as Queensland pigs are concerned. A large number could be classed as "maize-fed," but they rarely receive sufficient maize to cause soft pork or bacon.

Maize is the most widely grown grain in Queensland, but the pig industry is not dependent on this crop. It is very closely associated with dairying, the pigs being used primarily to consume the milk by-products—separated milk, buttermilk, and whey. Pasture, forage crops, and root crops also form a large part of the diet of pigs on some Queensland farms, and the grains—maize, wheat, and barley—are really only used as supplementary foods.

These points should be borne in mind when reading the advice of some overseas authorities, who state that maize should not constitute more than about 35 per cent. of the grain allowance of pigs. This may be sound advice under English conditions, where pigs frequently receive a diet which is about 90 per cent. grain and which usually does not contain milk products; but under Queensland conditions, where the feeding systems are as stated above, there appears to be little danger of pigs receiving sufficient maize to injure their carcase quality.

Most of the pigs produced in Queensland can be classed as "milk-fed."

SALT FOR PIGS.

Salt is harmful to pigs only when fed in excess. In tests to determine whether salt has any toxic effect, increasing amounts up to 2.5 oz. of salt a day were fed to pigs without any harmful result, and the animals gained normally in weight. This result was obtained under conditions in which the pigs had free access to water, for if pigs are fed increasing amounts of salt without water the result will be disastrous.

RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.40 a.m.

Right Type of Ewe for Fat Lamb Raising.

No matter what ram is fancied, if merino ewes form the mother flock, the fat lamb raiser is handicapped in the matter of profitable weights at an early age, or, in other words, early maturity.

The ewe most suitable for the production of early-maturing sucker lambs for export is got by the use of rams of one of the long-woolled breeds—such as the Romney Marsh, Border Leicester, or Lincoln—on the strongest, boldest type of merino ewe procurable. The ewe lambs from the resultant drop should be retained as the future breeding flock.

Pure-bred Corriedale ewes also are recommended as dams in a fat lamb raising flock.

On either type of ewe a Downs ram—such as the Southdown or Dorset Horn—should be used.

The ewe flock should be maintained in good strong store condition until lambing time. After lambing, no feed is too good for the ewe and lamb.

Under favourable conditions, fat lambs should be marketed at four months of age.

—*J. L. Hodge.*

FAULTY SKIRTING OF WOOL.

A visit to the wool stores should suffice to convince anyone of the seriousness of faulty work in the important matter of skirting the fleece. It is no uncommon thing to see half an offering consisting of brokens and pieces, and for no apparent reason.

Too often this work, which should be in the hands of trained men, is performed by casual shed hands, who may never have seen or handled a fleece before. Of course, the classer is blamed, but it should be remembered that he has a difficult job in a busy shed. How much easier would be his work if skirting were carried out by men trained to the job!

The worst of the fault is in overskirting. Much wool is taken off the fleece quite unnecessarily. The consequence is that the owner loses,

in the prices paid, the difference between the value given for the lower grades and his fleece prices.

Sheep owners should insist that men entrusted with the work on the tables should have had experience. The classer, too, should give clear instructions on the correct method of skirting the fleeces from each flock.

—*J. Carew.*

THE NEW ZEALAND CATTLE TICK.

In recent years, cattle owners in certain areas on the near North Coast have been perturbed by the presence on their stock of large numbers of a species of tick, which is quite different in appearance from the common cattle tick. The tick in question is the New Zealand cattle tick, a name given it on account of the frequency with which it occurs on cattle in New Zealand.

Like the common cattle tick, it is an introduced species, and is known to occur in Japan, India, Malay States, and East Africa, as well as in Australia and New Zealand. In Australia, the New Zealand cattle tick is present only in the North Coast areas of New South Wales and in South-eastern Queensland.

Details of its life cycle show that when engorged the female tick drops off the animal on which she has been feeding, crawls to some sheltered spot, and commences to lay her eggs. These hatch in the minimum time of about three weeks. The tiny larva then crawls on to a beast, becomes attached, and is full fed in four days. It then drops off, and after ten days on the ground develops into the nymph stage. The nymph in turn attaches itself to an animal, engorges with blood in four days, and again drops off to the ground. After another period of ten days it develops into an adult. The adult tick then seeks a host animal, becomes engorged in four days, and then, in a female, drops off and starts to lay her eggs.

In the case of the common cattle tick, the young larva, after hatching from the egg, crawls on to a beast, and there it remains until it becomes fully engorged; the female then drops off to lay eggs. Therefore, the larval stage is the only stage in the life cycle of the common cattle tick at which an animal can pick it up in the paddock. Control is a comparatively easy matter, and it may be obtained simply by regular dipping in an arsenical fluid, the period between dippings being such that any ticks on the animal are killed before they mature.

In the case of the New Zealand cattle tick, on the other hand, larvæ, nymphs, and young adults are all present in the grass, which means that no sooner is an animal cleansed of its infestation by dipping than it is again infested heavily by ticks just as large as the ticks with which it was infested before it was dipped. As during different stages in its life cycle it is present on an animal for at least four days, regular dippings at intervals of three days may be necessary. It may, however, be possible to utilise a dip which is more repellent than the usual arsenical solution, and thus secure a longer interval between dippings. Derris is known to have a repellent action against some species of ticks, and it may be worth while utilising an arsenical dip which contains

this ingredient. At least one such proprietary mixture is on the market, information concerning which may be obtained on application to the Animal Health Station, Yeerongpilly.

Experimental work has shown that the New Zealand cattle tick is not a vector of one of the organisms of tick fever in cattle, but its role as a possible carrier of the other two tick fever organisms is unknown.

—Dr. F. H. S. Roberts.

BROWN DOG TICK.

Of the many species of parasites infesting the dog, one of the most difficult to contend with is the brown dog tick. It is not an uncommon pest in Queensland, and on occasions may occur in such large numbers as to constitute a distinct menace to the health of the animals it infests. In such instances, the dog-owner finds that, no sooner has he cleansed his animals of all ticks by hand picking or washing, than the animals are infested just as heavily as before. A consideration of the life history of the tick shows why this is so.

The female tick, when fully engorged with blood, drops off the dog; and, crawling away to some sheltered spot on the ground, lays some thousands of eggs. These eggs hatch and give rise to tiny larval ticks which quickly attach themselves to any available dog. After feeding for a few days the larvæ drop off on to the ground and become nymphs. The nymphs then attach themselves to the dog and, on engorging themselves, drop off and develop into adults. The adults, in their turn, attach themselves to a dog; and, if females, drop off when engorged and lay many eggs. So the cycle goes on and the premises may become infested absolutely with larvæ, nymphs, and adults, all awaiting a chance to attach themselves to the dog. Moreover, these ticks, sheltering on the ground, may survive many months, should the opportunity of attaching themselves to a dog not present itself.

When the yards and surroundings are infested heavily it is of little benefit to attempt to control the pest simply by washing the dog in a dip mixture as so many owners do. The ticks naturally would be most numerous on those parts of the premises which are most frequented by the dog. The kennel should be cleansed thoroughly and sprayed with dip, the fluid being forced well into all cracks and crevices. The animal's blanket should be boiled frequently and the yards kept clean and tidy. In the case of house dogs the cracks in the flooring and walls should receive attention, and any other places in which the ticks may find shelter.

In addition, large numbers of ticks may be destroyed by washing the dog in a derris infusion. This wash is prepared by soaking 2 oz. of powdered derris in 1 gallon of water overnight. Next morning a sufficient quantity of soap is added to produce a good lather. This wash should be employed every six or seven days until no more ticks are seen.

If the ticks are at all numerous their control is largely a matter of patient effort, and it may be some time before any marked diminution in their numbers is apparent. All dog owners should be on the watch for this pest, and the measures advised here should be adopted so soon as any ticks, no matter how few in number, are seen.

—Dr. F. H. S. Roberts.

DERMATITIS.

A condition manifested by intense irritation, and development of dropsical swellings, and later death of unpigmented surfaces of the body, sometimes occurs during summer in country where trefoil and St. John's wort grow. It is only on white unpigmented patches of the animal's skin that the condition appears. Pigmented or coloured portions of the skin remain unaffected. Feeding experiments have proved that the ingestion of these plants together with exposure to strong sunlight bring about the condition. Cattle so affected show signs of much irritation, biting and licking themselves. Within a few days excoriation of the skin of unpigmented areas occurs. Animals become feverish and lose condition rapidly.

Sheep are affected similarly; the ears and face become thickened and dropsical, and the lips become hard and leathery. If shade is provided, animals seek it readily to obtain relief.

Staining of white patches on cattle with ordinary washing blue is protective. An application of a solution of permanganate of potash made with rain water to a deep pink colour gives relief.

—W. Dixon.

Registration of Hatcheries.

IN the last session of Parliament the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) introduced legislation for the voluntary registration of hatcheries. The object of the new measure is to control the disease known as pullorum disease. This disease is highly contagious, and is transmitted to chickens—firstly by the parent stock, and subsequently through the droppings.

Registration under the Act is voluntary, but its value to breeders who aim to supply buyers with chickens free from this disease is obvious.

Regulations have now been gazetted and circulated to breeders who trade in day-old chickens. A list of breeders who have been registered in accordance with the Act will be published monthly.

The following clauses of Regulation 29 will indicate to prospective purchasers the action being taken to ensure the distribution of healthy stock:—

(i.) All poultry at or upon such hatchery or kept at or upon such hatchery by the owner thereof shall have been tested in such manner as shall have been required by the Chief Poultry Expert, and all poultry infected with or suspected by the Chief Poultry Expert or an inspector of being infected with pullorum disease shall have been removed from such hatchery, and the said owner shall have paid to the Minister the cost as certified in writing by the Chief Poultry Expert of any such test.

(ii.) He shall not have at or upon or keep at or upon such hatchery breeding stock of poultry unless such breeding stock shall consist of a pure standard breed or breeds.

(iii.) He shall keep at such hatchery not less than 300 head of poultry which the Chief Poultry Expert or an inspector has certified in writing to be suitable for breeding purposes.

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal, and shall not sell or offer for sale any chickens which are deformed or injured in any way or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any inspector, or any officer to enter into or upon such hatchery and inspect the same.

QUEENSLAND SHOW DATES.

March.

Pittsworth	8th and 9th
Millmerran	11th
Oakey	15th and 16th
Goombungee	18th
Toowoomba	21st to 24th
Dalby	30th and 31st

April.

Chinchilla	5th and 6th
Yarraman	8th and 9th
Tara	13th and 14th
Miles	13th
Nanango	21st and 22nd
Wallumbilla	28th and 29th
Kingaroy	27th to 29th

May.

Longreach	2nd to 4th
Roma	3rd to 5th
Crow's Nest	4th and 5th
Monto	4th and 5th
Taroom	9th to 11th
Goondiwindi	6th and 7th
Wondai	5th and 6th
Blackall—	
Show	9th and 10th
Gymkhana	11th
Beaudesert—	
Show	11th and 12th
Campdraft	13th and 14th
Mundubbera	11th and 12th
Murgon	12th to 14th
Ipswich	17th to 20th
Barcaldine	17th and 18th
Goomeri	18th and 19th
Gayndah	18th and 19th
Mitchell	18th and 19th
Warrilview	21st
Biggenden	26th and 27th
Gympie	26th to 28th
Dirranbandi	27th and 28th
Kalbar	28th
Toogoolawah	27th and 28th
Maryborough	31st May to 2nd June

June.

Maryborough	31st May to 2nd June
Biloela	2nd to 4th
Lowood	3rd and 4th
Childers	6th and 7th
Boonah	8th and 9th
Bundaberg	9th to 11th
Wowan—	
Show	9th and 10th
Rodeo	11th
Gin Gin	13th and 14th
Gladstone	16th and 17th
Marburg	17th and 18th
Rockhampton	21st to 25th
Mackay	27th to 30th
Kilcoy	30th June and 1st July

July.

Kilcoy	30th June and 1st July
Proserpine	1st and 2nd
Nambour	7th to 9th
Cleveland	8th and 9th
Ayr	8th and 9th
Townsville	11th to 14th
Rosewood	15th and 16th
Esk	15th and 16th
Charters Towers—	
Show and Rodeo	19th to 21st
Laidley	20th and 21st
Maleny	21st and 22nd
Cairns	26th to 28th
Gatton	28th and 29th
Caboolture	29th and 30th

August.

Atherton	2nd and 3rd
Pine Rivers	5th and 6th
Home Hill	5th and 6th
Royal National, Brisbane	15th to 20th

September.

Imbil	2nd and 3rd
Ingham	2nd and 3rd
Pomona	9th and 10th
Tully	9th and 10th
Beenleigh	16th and 17th

Conditioning and Bulking of Tobacco Leaf.

R. C. CANNON, B.Sc., Instructor in Agriculture.

THE method employed in the handling of tobacco leaf after curing will appreciably affect the quality and value of the product. Consequently, just as much care should be exercised in the subsequent operations as in the curing itself. Before handling, the leaf should be brought into "condition" or "order" so that it may be handled without mechanical damage, and so that the chemical changes which tend to improve the colour, flavour, and aroma may proceed normally. Too much condition will tend to darken the colour, and may even result in the development of mould in the leaf. Where this is present there is a marked unpleasant "funky" odour, and in extreme cases the leaf will show definite signs of decay. Leaf in correct condition will be soft and pliable, with the exception of the butt ends of the midribs, which should be only slightly pliable. A little experience will soon make one adept at determining this requirement.

Conditioning.

Conditioning of leaf entails the addition of moisture to the whole body of the leaf tissue and not simply the outer layers. Rapid methods of attaining this objective usually result in a "false condition," which is rapidly lost during handling. To a very large extent the method to be employed will be determined by atmospheric conditions at the time. When moist nights are being experienced it will usually be quite sufficient to allow the leaf to hang in the barn overnight with the door and vents full open. Normally the leaf will be in good condition by morning, but under certain conditions of high atmospheric moisture this may be attained before daylight. In this case, it would be desirable to remove the leaf as soon as the correct condition has been attained, or else to allow it to become over-conditioned, and then to let it remain for some hours during the morning until the excess moisture has been lost.

When atmospheric conditions are so dry that leaf may not be conditioned by these means, recourse must be had to some way of artificially humidifying the air within the barn. This may be done by

closing the barn and spreading wet bags over the floor or else low-pressure steam may be introduced into the closed barn. In either case, the barn should remain closed for some considerable time in order that the moisture may penetrate the leaf. Of these two methods the former is the slower, but there is less risk of "false condition" than with the latter.

In certain circumstances, the crop in the field may be ripening very rapidly, thereby taxing barn accommodation, and growers may find it necessary to empty a barn with the least possible delay in order that it may be refilled. In such cases, it is often found advantageous to induce a "false condition" in the leaf for the sole purpose of transferring it from the barn to a building which may be used as a conditioning shed, where it can remain for a longer period under appropriate conditions to induce the requisite true condition before bulking down. Such a building should be provided with racks suitable for holding sticks of tobacco spaced so that the moist air has access to all parts. Some growers consider this to be a suitable procedure for normal working, and have made provision for a separate conditioning room adjoining the bulkshed.

The Bulkshed.

Where possible, the bulkshed should be located conveniently with respect to the curing barns so as to facilitate the transference of leaf after curing. The construction should be such as to render it comparatively unaffected by variations in atmospheric conditions, and should exclude as much strong light as possible.

The bulks may be of any size commensurate with the farmer's requirements, but should be wide enough to accommodate two sets of leaves with the tips slightly overlapping. The base of the bulk should be several inches above the floor level, so as to allow circulation of air, and should be made of boards spaced about 1 inch apart. The ends of the bulk should be similarly constructed to a height of 5 or 6 feet, and as they will be called upon to stand heavy weights they should be strongly constructed.

Bulking Down.

In bulking down, the usual procedure is to remove the leaf from the sticks before bulking, though at times it may be found more convenient to build temporary bulks of leaf on the sticks. A layer of bags or hessian should first be placed on the floor, and then the sticks of leaf placed so as to overlap all but a few inches of each other, so that the rather brittle butts of the leaves are not broken by the weight above them. For the sake of stability, it will be necessary to reverse the sticks at regular intervals in building the stack, so that the tips of one layer rest on the butts of the underlying layers.

The procedure for bulking down is the same whether or not the leaf has been temporarily bulked on the sticks. Several sticks are placed one on top of the other on a bench, and the string removed by gentle pulling so as not to unduly damage the butts of the leaves. Each bundle of leaf so obtained may then be removed and placed in position in the bulk. It has been found convenient to carry the bundle sandwiched between two pieces of light board. The leaf is then spread out in layers on the bulk with the butts facing outwards and the tips overlapping along the centre of the bulk. The second layer is placed

on the first with the butts a few inches further towards the centre and the tips overlapping to a greater extent. The third layer is placed to correspond with the first, and so on with alternate layers. When the day's operations are completed, planks should be placed on the top of the bulk and weights added to press down the leaf firmly. The weights used should be heavy enough to compact the bulk, but not so heavy as to break the tissues of the leaf and express the oils. The whole bulk should be covered with hessian or other suitable material to protect the tobacco from moisture changes in the surrounding air and to exclude strong light which is apt to bleach the leaf.

At regular intervals the bulks should be carefully examined for the presence of mould or for excessive development of heat, as a result of its having been bulked too moist. Should any suspicious symptoms be detected, the bulks should be taken down and the leaf shaken and aired before rebulking. In fact, it is desirable to make it a routine procedure to turn all bulks at least once. The leaf should be allowed to remain in bulk for five or six weeks before being removed for grading and sale.

HOME-MADE TOBACCO EXTRACTS.

Enquiries are received at the Department of Agriculture and Stock from time to time regarding methods of preparing home-made tobacco extracts, and this brief discussion may be of interest to others.

The nicotine content of the tobacco plant varies considerably, depending on the variety of the plant and the locality and type of soil in which it is grown. Therefore, no statement can be made as to the strength of a decoction that may be prepared by simple home or farm processes. The strength of the extract being uncertain, no guarantee can be given as to its effectiveness as an insect spray. The uncertainty of the qualities of the resultant product are further indicated by the wide variety of formulæ which are given in publications in which home-made tobacco washes are discussed. The proportions of the ingredients vary from 1 lb. of waste tobacco to 2½ gallons of water to 1 lb. of waste tobacco to 1 gallon of water. In general, it may be said that there is little danger of the resultant extract containing materials that will be injurious to living plant tissue, rather it may be the case that the solution is too weak for its particular purpose. The waste tobacco that is used may be stems and midribs, and it should preferably be of the dark varieties. The addition of washing soda at the rate of 1 oz. of washing soda to each 6 gallons of water has also been suggested.

The extract may be made either by cold soaking or by heating. For the former, the fluid should be stirred occasionally during a period of twenty-four to forty-eight hours. The fluid should then be drained from the tobacco and some further extract may be pressed from the plant material. The whole of the resultant fluid should then be strained and used direct as a spray liquid. Heating is quicker, but is somewhat more troublesome. The ingredients are added as before, the container being then placed over a fire and covered. The fire is retained until boiling point is just reached, when it should be raked out, or the vessel removed. The decoction is then allowed to cool and after straining is ready for

use. The extract obtained by this method has much the same properties as by the cold method. Actual boiling should be carefully avoided, as nicotine is very volatile, and it would be lost rapidly, were boiling to take place. The spray should be prepared as required and used immediately, as standing for a few days will result in fermentation, which will alter the chemical constituents and may reduce insecticidal properties.

Should it be desired to improve the wetting qualities of the spray, then soap may be added at the rate of 2 lb. of soap to each 50 gallons of spray. The soap should be shredded and dissolved by heating in a little of the water and then added to the bulk.

It must be emphasised that the use of standard nicotine preparations is recommended where a contact spray containing nicotine is required, but some farmers having a stock of waste tobacco may desire to try the effects of a home-made tobacco wash.

—*J. A. Weddell.*

CORN-EAR WORM IN THIS SEASON'S COTTON CROP.

W. J. S. SLOAN, B.Sc., Assistant Research Officer.

Corn-ear worm injury has already appeared in this season's crop. Good rains in November, 1937, resulted in heavy weed growth in and near cotton fields, while corn-ear worm moths emerged early in December.

By mid-December weeds were carrying large populations of the corn-ear worm caterpillar. Late in the month when the weeds dried up in the hot weather, the caterpillars migrated to the cotton. The damage was particularly severe in crops where inter-row cultivation had been insufficient to keep the cotton continuously free from weeds. Besides larval invasions from weeds, eggs were laid on the squaring cotton. In some areas the population of caterpillars which developed on the plants was large enough to cause considerable loss of squares, but, generally, square loss from caterpillars bred on the cotton was not heavy.

In view of the prevalence of the pest in December, the possible future trend of corn-ear worm activities can be indicated.

With good rains in January, a further attack may follow egg-laying on the plants in late January and early February. A dry hot spell in February followed by soaking rains will favour severe corn-ear worm outbreaks in late February and early March. If, however, the natural enemies which bred up during December prove effective, the corn-ear worm may not again be particularly prevalent for the rest of the season, but farmers should realise the risk of still further losses from the pest.

Should corn-ear worm invasions again occur, farmers are advised to use the swabbing method of control. This consists of flipping on to the cotton bushes already invaded or in danger of invasion, a mixture composed of the following ingredients:—1 lb. lead arsenate, 1 gallon molasses, and 6 gallons water.

Usually only one application of this treatment, at about 10 to 15 gallons per acre, is required to halt an invasion of corn-ear worm caterpillars. The solution can be conveniently applied with a whitewash brush.

Where the corn-ear worm population is bred up on cotton bushes within the field, there is some evidence to suggest that either swabbing or dusting may be beneficial. The swabbing should be done twice, with an interval of four to five days between each application. As an alternative, a calcium arsenate or a lead arsenate dust can be used at the rate of 5 to 7 lb. per acre, two dustings at an interval of four to five days being suggested.

Although corn-ear worm caterpillars migrating into a cotton field can be effectively controlled by swabbing, the Department of Agriculture and Stock cannot unreservedly recommend the large-scale insecticidal treatment of fields in which the pest is widely distributed as a result of heavy egg-laying in the cotton crop. Such treatment has not always proved profitable under Queensland conditions, but it is suggested that farmers use one of these methods on a small area for observational purposes, if a large population of the pest is bred on the crop.

THE LEAF-EATING PESTS OF COTTON.

From three weeks after the germination of the cotton this season there were few cotton fields in the Callide Valley and Upper Burnett which did not carry light populations of the cotton leaf-eating looper. During December and early January, the numbers of the leaf-eating looper increased, and the leaf perforator also began to appear in the fields.

From now on dry, hot weather periods interspersed with good rains may favour the increase of these insects to pest populations, and the following notes may be useful to cotton farmers faced with the necessity of applying control measures.

Both of these insects are primarily leaf-eaters, and in well-foliaged bushes their activities are not a matter of great concern. In lightly foliaged plants, however, the leaf injury may be harmful, and loss of squares may follow an attack on the tender tips of the bushes.

The first consideration is to maintain the health of the plants as far as possible by clean cultivation. Where direct control with insecticides is necessary, both swabbing with a poisoned molasses solution and dusting with calcium arsenate or lead arsenate at 5-7 lb. per acre will be found to be effective.

The swabbing solution for the leaf-eating insects is prepared according to the following formula:—1 lb. lead arsenate, 1 gallon of molasses, and 12 gallons of water. This mixture is flipped on to the cotton bushes with a whitewash brush at the rate of 10 to 20 gallons per acre, depending on the size of the bushes.

If the infestation of the leaf-eating looper is very heavy, a second application of the treatment may be required.

—*W. J. S. Sloan.*

AUTUMN PLANTING OF ENGLISH POTATOES IN CENTRAL QUEENSLAND.

In Central Queensland, the winter crop of potatoes is normally planted between mid-February and March, and, as the growing season is short, harvesting is usually in full swing by June. Climatic conditions are responsible for the comparatively short period between planting and maturity, and also the smaller yields in comparison with those obtained in more temperate regions.

Trials have disclosed that although the tubers attain normal size, the number per plant in this crop is comparatively low, which suggests that yields could be increased by closer planting. This opinion is confirmed by the successful crops obtained in areas where the seed tubers have been spaced 9 inches to 12 inches apart, instead of the wider 12 inches to 18 inches usually practised in the southern districts. As the yield per plant in the winter crop is apparently not reduced by the closer spacing, this method is valuable where small areas are under cultivation, particularly when irrigation facilities are available.

Fertilizer trials conducted on average soils have not shown any marked increase in yields, but further experimental work is necessary before a definite recommendation can be made. However, crops grown on the poorer soils, particularly of old cultivations, should benefit from substantial applications of phosphoric acid and potassic fertilizers.

As heavy rains are likely to be experienced at this period of the year, well-drained, free-working soils are to be preferred. Deep ploughing will be found to assist drainage, besides providing more favourable growing conditions.

If seed potatoes are purchased from outside sources, preplanting treatment with hot formalin or acid corrosive sublimate may be desirable.

Although cut tubers are permissible for spring planting, seed for the autumn crop should definitely comprise whole tubers only.

Attention is also directed to the control of Irish blight and other diseases by means of suitable sprays, full particulars of which may be obtained on application.

—*W. R. Straughan.*

FEEDING FARM HORSES.

It is not unusual to see a farm-hand pitchfork hay into a yard over which manure is thickly scattered. This is a source of loss and danger. Much of the hay is trampled into the dust or mud and rendered unusable. Even ensilage may be wasted in this way. A far greater, although more indirect, loss to the stocknower is caused by the contaminated feed. Many farm horses are infested with worms of various kinds, and dirty yards may teem with the parasites in their initial stages. These get into hay, or other feed tossed on to the ground, and are swallowed by stock, often with disastrous results. Heavy mortality among farm horses has been traced to worm infestation, and owners should exercise great care in feeding their working animals. A rack or a trough ensures greater cleanliness and saves waste of good feed.

—*S. C. O. Jessop.*

RHODES GRASS AS A HAY CROP.

While the value of Rhodes grass as pasture is well recognised in Queensland, its usefulness as a hay crop is little appreciated. Not only could fodder reserves be built up on the farm or station by conserving surplus Rhodes grass pasturage as hay, but, in some circumstances, sowing down of special areas to Rhodes grass for hay would be sound agricultural practice.

The cutting of hay from grassed country will be restricted, necessarily, to cleared land with a fairly even surface, and is practicable only in seasons of abundant growth. When seasonal conditions are such that a surplus of grass is indicated at an early date, the paddocks which can be mown should be closed to all stock and permitted to develop to the hay stage, when the crop may be harvested. In normal seasons, if the cutting is made during summer, the grass will recover quickly.

Apart from lucerne, the main summer-grown hay crops (e.g., Sudan grass and millets) are annuals. Cropping with annuals has the very obvious disadvantages of high cost of production and of exposing soils to erosive influences, particularly storm waters. A perennial or long-lived hay grass costs little to maintain, prevents erosion, improves the texture of the soil, and adds materially to its organic content. Although it is not suggested that Sudan grass and millets should be abandoned as hay crops in favour of Rhodes grass, farmers and pastoralists might well give consideration to the testing of Rhodes grass for hay purposes.

Because of its susceptibility to injury by heavy frosts, Rhodes grass is, however, not likely to prove more useful than a rotation of annuals in the colder regions of the State, such as parts of the Darling Downs.

In the drier localities in which Rhodes grass is grown largely, the hay is easily cured. In most cases it should be in the stack within forty-eight hours of cutting. The yield varies, of course, with seasonal and soil conditions, but on fertile soils young stands should provide at least two cuttings a year, each of 1½ to 2 tons of hay to the acre. The quality of the hay, particularly its palatability, is somewhat variable, but all classes of stock will eat it without much waste.

—*C. W. Winders.*

STORAGE OF SEED WHEAT.

A liability to weevil infestation is anticipated as a result of the wet conditions under which the last of the 1937 wheat crop was harvested. Even the grain harvested before the wet weather set in is open to attack if stored in barns, bins, or other receptacles which have been used previously for the purpose. It is recommended, therefore, that growers who have next season's seed on hand should treat it for the prevention of smut by applying 2 oz. of copper carbonate to each bushel. This treatment also acts as a deterrent to grain-destroying insects. The work should be done as soon as possible, for the copper acts more as a preventive than a curative agent of weevil infestation, and storage does not affect the efficacy of the treatment for smut or the viability of the seed in the least.

Clarendon, Pacific, Pusa, Warren 3004 (Warput), Seafoam, and Three Seas are among the varieties most suspectible to insect attack.

—*R. E. Soutter.*

HOME-MADE STOCK LICKS.

Graziers and farmers situated at long distances from manufacturing or distributing centres are often inclined to do without certain aids to progress, or use an inferior article on the score of cost. This is well exemplified in the case of licks for stock. Most producers know that salt, lime, and phosphates are the main ingredients of a lick. This has led to a growing tendency to reduce costs by mixing licks on the property, but there still remain some stockowners who use nothing, or perhaps salt alone, when a more complete supplement is required. Where it is possible to obtain wood ash it should be incorporated in the lick. It is not the complete solution of the problem, but its use is a decided help—particularly to breeders.

In general, the poorer the country the greater the lime content of the ash and the lower the phosphate. There are a few plants which give an ash rich in both lime and phosphate and correspondingly poor in potash. For example, the well-known "stinking rodger" gives an ash containing about 16 per cent. phosphoric anhydride and 27 per cent. lime; while the ash from the blue gum contains 14 per cent. phosphoric anhydride and 19 per cent. lime. These ashes may represent the greater proportion of a lick. The obvious drawback is the limited quantities obtainable and the difficulty of collection. Grey gum, crow's foot elm, bloodwood, cane tops, and iron bark come next in that order.

Belah, bottle-tree, apple-tree, box, and tallowwood are very low in phosphate. Belah contains about one-fiftieth of 1 per cent. and must rank as the lowest. This is readily understood when it is remembered that belah will flourish on a soil poor in phosphate. In striking contrast is its 50 per cent. lime content. Ash from tallowwood and gidgee also show a 50 per cent. lime. Their phosphate content ranges from ·5 per cent. to 1 per cent. Most of the unlisted trees give ashes with a phosphate content of from 1 per cent. to 2 per cent.

Collection.—Ashes from the home fires should be collected and stored throughout the year. When practicable, material from burning off should be collected. It should be gathered as soon after burning as possible, because rain soon damages it. The ashes from the burnt sawdust of timber mills are a useful source of cheap material. In short, all available ashes should be kept, for it takes a lot to make a ton and it is a hopeless task trying to get enough ashes just when needed.

Preparation.—Fresh ashes are caustic in nature, but if allowed to age under cover they gradually lose this distasteful quality, and after a few weeks they may be fed to stock with safety. See that the material is as free as possible from dirt and antbed. Screen out the coarse charcoal. This may be done easily by setting an old spring mattress at an angle against a wall and shovelling the ashes on to it. The fine ash is collected, and the charcoal returned to the fire or thrown into the pig sty.

Mixing.—No set rule for mixing can be given. The proportions required vary with the composition of the ash. The phosphate-rich ashes may represent as much as two-thirds of the mixture. In the case of low-phosphate high-lime ashes, this proportion usually limits the intake markedly and consequently must be altered. Here again a definite figure cannot be given, but 30 per cent. to 40 per cent. may be used, unless experience or supplies indicate to the contrary.

THE CARE OF PASTURES.

Many of the pastoral areas in Queensland are now well covered with grass and herbage, as a result of recent heavy rains. If further widely distributed summer rains fall, a good autumn crop of long grass will be assured. The effect of this autumn long grass is to supplement the organic constituents of the soil. This augumented organic content will tend to maintain the fertility of the pastures. In ordinary circumstances, pastures should not be burnt off. This applies especially to sown pastures, such as paspalum and Rhodes grasses. The effect of a severe grass fire is to reduce greatly the potential supply of the organic constituents of the soil. If persisted in, the practice of burning off may result in sterility of the soil. It is possible that bush fires recurring annually form one of the principal factors in the reduction of the fertility of much open forest country to far below that of rain-forest country.

In burnt-over areas, an invasion of non-nutritious grasses may always be looked for. In particular, the farmer with paspalum pastures can watch for the entrance of carpet grasses and rat's-tail grass. The prompt eradication of these almost worthless intruders may mean the saving of many weeks of labour in two or three years' time, when, otherwise, these invading grasses shall have spread and seeded.

In paspalum pastures, ordinary white clover should be fostered. A good pasture of this kind can often be established by broadcasting a few ounces of white clover seed to the acre in a paspalum paddock. This can be done during autumn. Generally, white clover prefers a sandy soil.

—*W. D. Francis.*

CEMENTED BAGS FOR LIGHT FARM BUILDINGS.

The ubiquitous chaff and cement bag can be turned to good account in the building of fowlhouses or similar farm buildings of light construction, according to the following plan, which has proved successful in practice:—

A framework of timber is first of all built up, after which wheat or cement bags are opened out and stretched very tightly over it, being nailed down with $\frac{5}{8}$-inch clout tacks. Next, a mixture is made up as follows:—

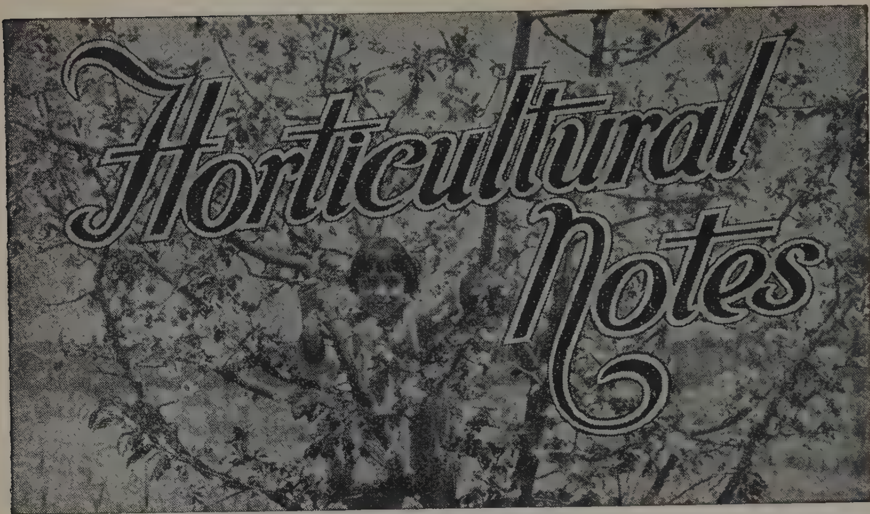
Water, $1\frac{1}{4}$ gallons,
Cement, 12 lb.,
Lime, 2 lb.,
Salt, 1 lb.,
Alum, $\frac{1}{2}$ lb.

(In damp wet weather use 1 pint of water.)

Sieve the salt and lime together through a fine sieve—to thoroughly mix the materials and get rid of any big lumps—add the water and then the cement—stirring while adding—and finally the alum. Wet the stretched bags with water and apply the mixture without delay, using a fairly stiff brush, first on the outside, and then on the inside. Before the mixture sets, but after the initial wetness disappears, apply a second coat to the outside. When this sets, the bags will be quite hard and stiff, somewhat like plaster board. Subsequent coatings will, of course, make a stronger board.

The cost of the process, including bags for the foundations, works out at about 8d. a square yard. From this it will be seen that it is a very cheap and easy method of construction. Sheds built according to this plan three years ago show no signs of disintegration.

—*H. W. Ball.*



Colouring Citrus Fruit.

THE Director of Fruit Culture (Mr. H. Barnes) advises that an experiment of particular interest to citrus growers who adopt the practice of artificially colouring their citrus fruit has been completed by the Instructor in Fruit Packing (Mr. J. H. Gregory) and the Instructor in Fruit Culture (Mr. R. Prest).

In their report these officers state that in order to make the experiment as practicable as possible from the fruitgrower's point of view, it was carried out in as nearly as possible under ordinary orchard conditions. For this reason, although daily recordings were kept, no attempt was made at temperature or humidity control as most growers do not take these matters into account.

Three common colouring agents were used—ethylene gas, acetylene gas, and a kerosene lamp. The reaction of the fruit after treatment was carefully observed to determine the amount of visible skin damage. Three properly-insulated cabinets were used, and fruit in varying stages of ripeness was treated. The joppa orange and emperor mandarin were the varieties chosen for the tests.

Three charges of gas were given daily during the first three days, after which two charges were given. Before each charge, each chamber was thoroughly ventilated.

The trial with the oranges was started on 15th May, and that with the mandarins on 22nd May (1937). The fruit when picked was placed in the cabinets without delay.

Before being gassed, the oranges were sorted into three colour grades:—(*a*) coloured; (*b*) half-coloured; and (*c*) green. Each cabinet contained a case of each colour grade, enabling a comparison to be made of the effects of immaturity on the colouring of the fruit.

Gas was supplied as follows:—

Chamber 1.—Acetylene gas at the rate of 1 oz. carbide to each charge.

Chamber 2—Ethylene gas at the rate of 1 cubic foot to 1,000 cubic feet of air, twice daily.

Chamber 3.—Carbon dioxide, kerosene lamp filled and lit twice daily.

The fruit was sorted into three colour grades and placed in the colouring cabinets as follows:—

(*a*) *Coloured.*—Fruit full coloured and practically ready for market.

(*b*) *Half Coloured.*—Fruit matured, but not fully coloured.

(*c*) *Green.*—Fruit apparently matured, but lacking in orange colour.

Daily examination showed the following colouring developments with the various treatments.

Cabinet No.		(1)	(2)	(3)
Date.		Acetylene Gas.	Ethylene Gas.	Kerosene Lamp, Carbon Dioxide.
15th to 17th May	Coloured .. Half-coloured .. Green ..	No noticeable change in colour.		
18th May ..	Coloured ..	Ready for market. Bright appearance	Ready for market. Bright appearance	Practically ready for market. Dullest colour; 2 mouldy
	Half-coloured ..	Increased colour	Increased colour	Colour increasing, but fruit dull in appearance; 1 mouldy
	Green ..	Colouring satisfactorily	Colouring satisfactorily	Commencing to colour but not as forward as chambers 1 and 2
	Coloured ..	Ready for market; 1 mouldy.	Ready for market; 2 mouldy	Ready for market. Dull coloured and slightly wilted in appearance.
19th May ..	Half-coloured ..	Colouring evenly; bright appearance; no signs of wilting	Colouring evenly; bright appearance; no wilting	Colouring evenly; fruit dull in appearance; 1 mouldy
	Green ..	Colouring increasing; bright appearance maintained	No noticeable difference in comparison with acetylene-treated fruit.	Fruit colouring, but dull in appearance
NOTE.—Coloured fruit removed for marketing.				
22nd May ..	Half-coloured ..	Fruit colouring; 60 per cent. coloured; no wilting noticeable	Fruit as in acetylene; 1 mouldy	Fruit dull in colour; some fruit uneven in appearance
	Green ..	Fruit half coloured; bright, but yellowish	Fruit as in acetylene	Colour of fruit uneven; dullish yellow; unattractive in appearance
25th May ..	Fruit removed through breakdown with mould:—	1 mouldy	1 mouldy	2 mouldy
26th May ..	Half-coloured ..	Fruit nearly ready for market; bright	As in acetylene	Fruit backward in appearance compared with 1 and 2; dull in colour
	Green ..	Fruit apparently at full limit of colouring; skin yellow; not satisfactory	As in acetylene chambers	Poor, dull colour; some fruit uneven, and, in some cases, not suitable for market
All oranges removed and sent to market.		12 mouldy	9 mouldy	15 mouldy

All oranges were taken to what was considered the absolute limit of ripeness obtainable, so that an observation of their carrying quality might be observed. This to some extent is the reason of the number of the specimens, as follows, rejected for mould:—

1. Ethylene treated 11
2. Acetylene treated 14
3. Kerosene lamp-cambon dioxide treated .. 21

The effect on colour by gases was of extreme interest.

Acetylene and Ethylene Gases.—Fruit treated by these gases was similar in appearance; some fruit was not fully matured, colouring little better than a canary yellow.

Kerosene Lamp.—Fruit generally was dull and lustreless, with poor colour; a few specimens were very poor in colour.

From observations during the experiment the following facts were noted:—

(1) Immature fruit will not colour satisfactorily, being of a dull, lifeless greenish-yellow colour when the process is finished.

(2) The use of a kerosene lamp is almost valuless as its effects do not enhance the colouring, the fruit showing a higher percentage of wilt.

(3) There is not much apparent difference in efficiency between acetylene and ethylene gas in colouring, although ethylene appeared to have a slight advantage over acetylene.

TEMPERATURE AND HUMIDITY CHART.

Chamber	1			2			3		
Date.	Wet.	Dry.	Hum.	Wet.	Dry.	Hum.	Wet.	Dry.	Hum.
May 15, 9 a.m. ..	60	70	55	59	66	66	59	66	66
May 17, 9 a.m. ..	58	65	66	59	63	79	60	65	75
p.m. ..	60	62	89	61	65	80	68	72	82
May 18, 9 a.m. ..	54	60	68	54	60	68	55	62	64
p.m. ..	59	66	66	58	65	66	60	69	59
May, 19, 9 a.m. ..	57	62	74	56	60	78	58	64	66
p.m. ..	59	64	74	59	63	79	67	72	77
May 20, 9 a.m. ..	60	64	79	58	63	74	61	62	94
p.m. ..	62	68	71	62	66	80	72	79	71
May 21, 9 a.m. ..	65	69	81	65	69	81	64	69	76
p.m. ..	67	72	77	66	70	72	68	74	74
May 22, 9 a.m. ..	61	64	84	61	64	84	61	64	84
			Saturday, one reading only.						
May 24, 9 a.m. ..	63	67	80	63	67	80	65	69	81
p.m. ..	64	68	80	64	68	80	71	74	86
May 25, 9 a.m. ..	61	65	80	61	65	80	65	68	85
p.m. ..	66	69	85	66	69	85	70	73	86
May 26, 9 a.m. ..	61	64	84	61	64	84	64	67	85
May 27, 9 a.m. ..	61	64	84	61	64	84	62	65	85
May 28, 9 a.m. ..	60	63	84	60	62	89	61	64	84

Mandarin Experiment.

The mandarins were placed in the chambers on 22nd May. Unfortunately, because of dry weather, the fruit was forward in both colour and maturity. It was, however, considered that helpful observations on keeping qualities of the fruit in various gases might be made with

the fruit available. A count of the waste fruit during the experiment revealed the following results in order of merit:—

Ethylene gas	9-6·5 per cent.
Acetylene gas	12-8·6 per cent.
Kerosene lamp-carbon dioxide ..	15-10·3 per cent.

A difference in colour was noticeable, the ethylene and acetylene gassed fruit both being brighter in appearance than the kerosene lamp treated fruit. Summarised, the results with mandarins appear to be similar to those obtained with the oranges. It is interesting to note that both fruits have the smallest amount of waste in the ethlyene chamber, with the acetylene and kerosene lamp chambers, in that order, containing the higher percentages. In years of normal rainfall, it is anticipated that a higher percentage of waste would occur than with a dry season.

Queensland Woodwool.

The following progress report by Mr. J. H. Gregory, Instructor in Fruit Packing, on experiments in the use of Queensland woodwool in pineapple-packing has been transmitted to the Minister for Agriculture and Stock (Hon. Frank W. Bulcock, M.L.A.) by the Director of Fruit Culture (Mr. H. Barnes).

At the request of the Forestry Department, experiments were made as to various methods of using waste timbers in the fruit trade. It was suggested that fruit cases, sawdust, and woodwool were among the products to be derived from the use of timbers, such as *Pinus tæda* and *Pinus caribea,* obtainable from five to seven-year-old thinnings from the forestry plantations at Beerwah. *P. tæda* proved most suitable as a case timber, the cases being made from the butt logs of the thinned trees. This still left the tops of the trees as waste. It was then suggested that the tops might possibly be used to make woodwool for packing pineapples, papaws and similar fruits. In addition to this, it was proposed the woodwool could be tried as a cover for pineapples in the field for protection from sun and wind. Hitherto, all woodwool used in the fruit industry has been imported, but the woodwool used was of local manufacture; so it can readily be seen that considerable advantage would accrue to the State by the development of this industry. It is estimated that from 200 to 300 tons per annum of this material could be used, and, with the further expansion of pineapple production, possibly more. The value of this woodwool is estimated at from £2,000 to £3,000 in the pineapple industry alone. In addition to *P. tæda* (coarse and fine), hoop pine was tried. A check also was made with imported material. A strictly commercial test was made on the basis of growers' application, checked, and counted. In addition, a small check was carried out in both packing and covering. The results were interesting and, to some extent, unforeseen in the actual difference between the woodwools used.

The qualities that go to make good woodwool for packing are softness of texture, good teasing qualities, freedom from dust and short ends, springiness, and colour. Both coarse and fine woodwool are obtainable. Only the finer woodwools are suitable for packing fruit, the very coarse grades being used for packing crockery, ironware, and similar goods. *P. tæda* and hoop pine can be made into a woodwool that will answer to all the requirements of fruit-packing. The tests of the fine types of these varieties compared more than

favourably with other kinds, as the fine cuts from these two pines proved in every way superior to all other types tried out. The following were the results obtained in the tests for packing quality:—

TABLE I.

Number.	Type of Woodwool.	Weight used in Test.	No. of Cases Packed.	Counts and Total Fruit.	Growers' Remarks.
1. Palmwoods	Hoop pine (fine)	2 lb.	3¾	12, 14, 18, 15 (21) —Total 59	Good ; teasing not as easy as some imported lines, but equal to most ; colour yellowish, no drawback in practice.
	P. tæda (fine)	2 lb.	3	12, 14, 18—Total 44	Looks good ; a bit slow in teasing ; quite as good as imported woodwools.
	P. tæda (coarse)	5 lb.	6	11, 18, 21, 12, 21, 27—Total 110	Wasteful, but easy to tease and pack.
Check ..	Imported ..	2 lb.	2	15, 18—Total 33	In operation no better than coarse *P. tæda*, showing about the same drop in waste ; texture not as good as hoop pine or fine *P. tæda*, but better than coarse *P. tæda* ; colour not as good as either of above, but whiter than hoop pine
Ditto ..	Hoop pine	2 lb.	2	18, 21, (7)—Total 46	Enough woodwool over to cover bottom of case and layer of pines ; everything but colour perfect ; do not think colour is any great handicap.
Ditto ..	*P. tæda* (fine)	2 lb.	2	18, 21—total 39	Better colour than hoop pine, but not so fine in texture or so holding in teasing quality.
Ditto ..	*P. tæda* (coarse)	2 lb.	2	15, 18—total 33	Equal to imported as packing, but has large drop of loose ends ; too brittle ; teases only fair ; would suggest it be made wider in cut but thinner in depth.
2. Palmwoods	Hoop pine (fine)	5 lb.	5	18, 18, 18, 21, 15 —total 90	Best woodwool ever used ; soft, springy, excellent packing.
Ditto ..	*P. tæda* (fine)	5 lb.	4	18, 24, 21, 18—total 81	Good ; teases well ; little waste ; fine colour and texture.
Ditto ..	*P. tæda* (coarse)	5 lb.	3¾	18, 24, 21 18 (less 7)—total 74	Only fair ; teases fair ; too coarse and hard ; heavy drop.
3. Palmwoods	*P. tæda* (fine)	5 lb.	4 (+ 2 layers)	12, 14, 15, 18 (+ 14)—total 73	Best woodwool yet used, better than imported : teases well ; springy and soft ; fine colour ; no dust ; good texture.
Ditto ..	*P. tæda* (coarse)	5 lb.	3 (+ 2 layers)	12, 14, 15 (+ 14) —total 55	Not so good ; too brittle ; not comparable with fine-cut ; not as good as imported.
Ditto ..		No hoop pine available.			
4. Palmwoods	*P. tæda* (fine)	5 lb.	4 (+ 5 pines)	18, 18, 21, 12, 5 —total 74	Teases well ; compares favourably with imported ; cut a bit short.
Ditto ..	*P. tæda* (coarse)	5 lb.	4	18, 18, 21, 12—total 69	Too woody ; cut too thick ; more waste than in fine.
Ditto ..	No hoop pine available.				
5. Montville ..	Hoop pine	5 lb.	6	18, 18, 18, 18, 21, 21—total 114	Excellent in every way ; soft, springy and tough.
Ditto ..	*P. tæda* (fine)	5 lb.	5	18, 21, 18, 21, 18 total 96	Better than "Willow" brand, but not as good as hoop, which packs more.
Ditto ..	*P. tæda* (coarse)	5 lb.	4	21, 21, 21, 18—total 81	Does not tease too well ; not as good as "Willow" brand ; heavy drop when using ; too hard.
6. Montville ..	*P. tæda* (coarse)	6 lb.	4	18's—total 72 ..	..
	Imported ..	6 lb.	4	18's—total 72 ..	Small amount left over.

The average number of pineapples packed per lb. of woodwool by all growers through the whole of the test was as follows:—

Hoop pine	22·07 pines
Fine *P. tæda*	16·96 "
Imported	16·5 "
Coarse *P. tæda*	16·0 "

The average number per lb. packed by only those growers who used all types was—

Hoop pine	22·07 pines
Fine *P. tæda*	18·57 "
Coarse *P. tæda*	17·53 "
Imported	16·5 "

Tests for covering pines in the field as a protection against sun and weather conditions proved no less interesting. The coarse types of woodwool were totally unsuited for this work, so only the fine types were used. A small check test showed that imported woodwool had no advantages over *P. tæda* and hoop pine, so to save time only the two woodwools mentioned were used. The following table shows the results obtained:—

Number.	Type of Woodwool.	Weight Used.	No. of Fruit Covered.	Total Time Taken.	Approximate Time per Fruit.	Growers' Remarks.
1. Palmwoods	P. *tæda* (fine)	2 lb.	84	6 min. 5 sec.	4½ sec.	Hoop pine much preferred; wraps round fruit more easily, and appears to hold better.
	Hoop pine	2 lb.	131	9 min. 40 sec.	4½ sec.	
2. Palmwoods	P. *tæda* (fine)	2 lb.	49	9 min. 35 sec.	7½ sec.	Hoop pine superior; would like to see it after weather.
	Hoop pine	2 lb.	77	12 min. 10 sec.	9½ sec.	
3. Montville ..	*P. tæda* (fine)	2 lb.	116	7 min. 52 sec.	4 sec.	Hoop pine stands alone; has tried all woodwools, and the recovery of hoop pine is more than with other kinds.
	Hoop pine	2 lb.	144	11 min. 30 sec.	4¾ sec.	
4. Montville	*P. tæda* (coarse)	2 lb.	84	No times taken.		
	Imported ..	2 lb.	89	No times taken.		

A small test of imported *P. tæda* and hoop pine woodwools showed the various types in the following order of merit—Hoop pine, *P. tæda* (imported).

For field use it would be most unsatisfactory to attempt to us any woodwool which would not tease and which drops. It is exceptionally hard to get woodwool to remain on the covered pines through wind and rain storms. The actual recovery of woodwool from covered pines is small. It is estimated that hoop pine gives up to 40 per cent. for use again, while imported woodwool gives not more than 10 per cent., the weather causing the loss. This is an advantage in favour of the hoop pine. It is not considered that the fine type of *P. tæda* is at the present time as good as the hoop pine, whilst the present type of coarse *P. tæda* is not even suitable for use in covering. There has been no opportunity, of course, of checking *P. tæda* under weathering conditions. Some new types have been suggested and it is hoped they will be stronger without sacrificing covering quality.

From the experiments of grading the woodwools in their order of merit with regard to both packing and covering, they would be placed as follows:—

1. Hoop pine;
2. *P. tæda* (fine);
3. Imported;
4. *P. tæda* (coarse).

Criticism is offered with regard to each of the Queensland types of woodwool used—

Hoop pine (fine)—

This is an excellent woodwool for all purposes, conforming to all standards for fruit-packing except colour. It is soft, springy, and pliable, free from dust, and does not drop many short ends when in use. It would be an advantage if the timber were white instead of yellow, but personally this is not considered any great detriment to its use. With use on the markets, it would soon become acceptable. For covering fruit in the field a coarser type would possibly be of advantage. Types of coarse hoop pine woodwool inspected were unsuited to the fruit trade, being brittle and too much like elongated match-sticks. Other types of hoop pine woodwool are being manufactured for future trials.

Pinus tæda (fine)—

An excellent woodwool, but not quite on a par with hoop pine excepting in colour, in which respect it is definitely superior to hoop pine and quite equal to any woodwool handled, including the best Swedish brands. Other types are being manufactured for further trials.

Pinus tæda (coarse)—

In comparison with the fine woodwools, it is not a success.

Imported Woodwool—

An examination of a number of bales of this showed quite a difference in qualities, some being soft and some brittle. The sample used was only slightly better than *P. tæda* (coarse). Better samples of imported woodwools than this have been seen in the past, but, whilst being better than the coarser Queensland woodwools, they would not be as good as the fine hoop pine or fine *P. tæda*.

The tests to date have been of a satisfactory nature as shown in these results. A further investigation of woodwools made on different lines is to be carried out, when it is hoped that even better results will be obtained.

PINEAPPLE MARKETING.

As the summer smooth leaf pineapple crop in South Queensland will soon be on the market, the necessity of packing only good class, matured fruit calls for emphasis.

There is always the tendency with some growers to pick the first shipments of pineapples too closely, with the result that these consignments lag on the Southern markets, waiting for the necessary colour to develop. Subsequent consignments arrive on top of an already loaded market, and have the effect of reducing prices. Complaints that pineapples are arriving far too green and are consequently very hard to move off the market are very common. Such fruit never ripens into an attractive condition.

Pineapples for the Southern markets should not be picked until there is a distinct sign of colour at the base of the fruit. Only fruit left until this stage will develop into a good eatable commodity.

None but good quality fruits free from sunburn, mechanical injury, or insect damage, and which are reasonably assured of being free from water blister, should be packed. Packing with woodwool is much preferable to grass; the pack always opens up cleaner and drier when the former is used.

Packing fruit to a nice grade is also a further factor in favour of a consignment. Any malformed fruit, or that which may have had the tops destroyed by frost, should not be packed. Cleanliness in the packing shed will keep the fruit free from most of the troubles which influence market values.

—E. F. Duffy.

RESOILING RAIN-WASHED ORCHARD LAND.

Repairing the damage caused by the recent heavy rains scouring gutters through the orchard is an operation requiring considerable thought, if the work is to be permanent. A repetition of the occurrence is inevitable where the work has been done haphazardly.

Land denuded of the surface soil presents a hard surface with which the replaced soil will not readily combine. Realisation of this important fact is one of the essentials of a successful job.

Whatever method is employed to repair the damage by replacing soil, it is of the greatest importance that the exposed hard areas should be treated first. Where practicable, the subsoil plough is the best implement to use, but any strong-toothed implement which will break up the surface will serve the purpose. Besides assisting in drainage, this will allow the overburden of replaced soil to incorporate with the subsoil.

If, however, repairing the damaged area entails very much labour, it may be advisable to commence resoiling at the higher levels first. If this is not done, and heavy rain interrupts the work, the undiverted water may again flow down the gutters and carry away the replaced soil on the lower portions.

For general purposes, and where soil can be taken from land adjacent to the orchard, a scoop should be used. Unless it is very soft, the ground should be ploughed before scooping, and careful ploughing to an even depth will greatly facilitate scooping.

—A. M. Richardson.

THE AFTER CARE OF GRAFTS.

Any deciduous fruit trees that have been grafted this season should be examined from time to time, and when the growth is about 8 inches long the wax cloth and string should be cut through with a sharp knife to allow for expansion, otherwise the string will cut into the bark and ruin the graft. Many grafts are ruined each year on account of growers omitting to do this necessary work.

When cutting, first cut through the wax cloth and string only; do not remove the wax cloth. The scion will push it off, and until then it serves a very useful purpose in protecting the cut surface of the limb from the sun and spores of fungus diseases.

Many fungus diseases are what might be called wound parasites, and an unprotected cut surface is an easy place of entry for them.

Do not allow shoot growth from the stock to overcrowd or rob the scions, and when checking any such growth, note whether any grafts have failed; if so, thin out the shoot growth so as to allow two or three shoots to develop sufficiently and in the right place, so that they can be budded to take the place of the dead graft.

The best time for the budding of these shoots will be from the end of January to the middle of February. The shoots to be budded must be making growth, or else there will be no sap flow to form the union.

The buds should also be taken from the current season's growth and from shoots that are still making growth. The buds should be cut from about the centre of the shoot, as they will prove more satisfactory than those taken from near the base or tip.

—*H. St. J. Pratt.*

MARKING TREES IN THE ORCHARD.

Because it is found impracticable to apply corrective methods immediately to drone fruit trees, or to trees known to require some specialised treatment for disease at some more opportune time, it is wise not to leave future identification of the tree to guesswork. The simplest way of marking such trees is by tying a narrow strip of cloth—preferably white—to a conspicuous limb.

In the case of individual trees giving light annual crops, pruning may be at fault. It is possible, too, that an individual tree may be a host of some serious pest that has not yet established itself throughout the orchard. The white rag indicator will serve as a reminder at a time later on when the necessary control can be conveniently applied. By marking the tree, the observant orchardist also will be able to note from time to time the efficiency of the control applied.

Unsuitable varieties and poor fruit types observed during harvesting and marked are not likely to be overlooked when reworking is being done in the proper season if they can be easily identified.

—*A. M. Richardson.*

The Fruit Market.

JAS. H. GREGORY, Instructor in Fruit Packing.

DRY weather in February succeeded excessive rain in January. Rain is again needed for the coming fruit crops to ensure size and colour. Queensland's stone fruit season is nearly finished. Prices during the second half of February were disappointing. Some excellent quality stone fruits were marketed during the season. Good quality Jonathan and Gravenstein apples found a ready sale, but small sizes were hard to quit. Growers of these varieties would find it an advantage to thin out when a heavy crop has been set. Granny Smith and Delicious prices were forced down to low levels through immature fruit being marketed. Prices for these two varieties should improve as better quality fruit is marketed. Grapes have been in full supply, quality fruit realising good prices. An experimental consignment of 407 cases was despatched in February to Hong Kong. The varieties sent were Black Muscats, Red Malaga, and Chaouck. Lemons have eased slightly in price, but are still maintaining very high values for first quality fruit. Oranges also have been realising high prices, and have reached levels that bring back memories of "the good old days." Palestine grapefruit has made its appearance for the first time in Queensland, selling at up to 38s. per large citrus case. This fruit of the Marsh Seedless is packed in an attractive wrapper. The quality appears to be quite good, and the coming of this type should assist in developing a taste for the first quality grapefruit now being produced in Queensland. Pineapples have maintained firm values for choice lines of Ripleys. Supplies of Smooths have been on the heavy side, consequently values have been easier.

The banana market leaves room for price increases, values in Sydney and Melbourne being particularly low. It is expected that values will rise as stone fruit supplies decrease. Some excellent fruit has been marketed. Prices during February were:—

TROPICAL FRUITS.

Bananas (Cavendish).

Brisbane.—Nines, 8s. to 10s. per case; eights, 5s. to 12s. 6d.; sevens, 4s. to 11s.; sixes, 4s. to 9s.

Sydney.—Nines and eights, 9s. to 12s. per case; sevens, 7s. to 9s.; sixes, 5s. to 6s.

Melbourne.—Nines, 8s. to 10s. per case; eights, 7s. to 10s.; sevens, 6s. to 8s.; sixes, 6s. to 7s.

Lady's Finger.

2d. to 8d. per dozen.

Sugars.

1½d. to 6½d. per dozen.

Papaws.

Sydney.—16s. to 18s. per case.

Melbourne.—To 14s. per case.

Pineapples (Smoothleaf).

Brisbane.—4s. to 6s. 6d. per case, 1s. 6d. to 5s. 6d. per dozen. Ripleys, 6s. to 9s. per case, 1s. 6d. to 6s. per dozen.

Sydney.—7s. to 10s. per case.

Melbourne.—7s. to 12s. per case.

Water blister prevalent. Extra care in handling is necessary during the warm humid weather being experienced.

Custard Apples.

Prospects are good for the coming season. Early consignments should not be marketed until fully matured.

Monstera Deliciosa.

Brisbane.—3s. to 4s. per dozen. Specials higher.

Melbourne.—6s. to 8s. per half-case.

Mangoes.

Brisbane.—Special types to 8s.; common mangoes slow of sale.

Melbourne.—Market slow, 3s. to 4s. per half bushel.

With cooler weather developing in the South, the popularity of this fruit is on the wane.

Avocados.

This fruit will soon be making its appearance on the market. Packers are advised to wrap and pad well with woodwool when sending long distances.

CITRUS FRUITS.

Oranges.

Brisbane.—5s. to 15s. per bushel.

Sydney.—Valencias, 4s. to 10s. per bushel.

Grapefruit.

Brisbane.—Palestine, 38s. per large citrus case.

Melbourne.—6s. to 15s. per bushel.

Lemons.

Brisbane.—Local, 7s. to 10s. per bushel case; Gayndah, 10s. to 15s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 4s. to 7s. per bushel; Granny Smith, 3s. to 7s. per bushel; Delicious, 4s. to 6s. per bushel. Hail-marked and inferior quality lower.

Sydney.—Jonathan, 3s. to 8s. per bushel; Granny Smith, 3s. to 6s. per bushel.

Pears.

Brisbane.—Gansell's Bergamont, 7s. to 9s.; W.B.C., 9s. to 11s.; Howell's, 6s. to 8s.; B. de Caps, 6s. to 8s. 6d.

Peaches.

Brisbane.—1s. 6d. to 3s. Sales slow.

Plums.

Brisbane.—Ponds, 5s. to 7s.; Grand Duke, 5s. to 6s.; President, 5s. to 6s.

OTHER FRUITS.

Grapes.

Brisbane.—Stanthorpe Black Muscats, 3s. 6d. to 5s.; Ascots, 3s. to to 3s. 6d.; Colemans, 3s. 6d. to 4s.

Tomatoes.

Brisbane.—Coloured, 2s. 6d. to 5s. 6d. per half bushel; ripe, 2s. to 4s. per half bushel; green, 2s. to 3s. per half bushel.

Sydney.—Queensland, 5s. to 7s. Few specials higher.

Melbourne.—2s. to 6s. per bushel.

Green fruit in Brisbane slow of sale.

Passion Fruit.

Brisbane.—8s. to 11s. per half bushel; seconds, 4s. to 6s.

Sydney.—6s. to 12s.

Melbourne.—3s. to 7s.

Figs.

Brisbane.—1s. 6d. to 2s. per tray, 4s. to 6s. per dozen boxes.

Quinces.

Brisbane.—5s. to 6s. a bushel.

VEGETABLES.

Brisbane.—Rosellas, 1s. 6d. to 2s. 6d. sugar bag. Rockmelons, Stanthorpe, 4s. to 5s. a bushel. Cucumbers, 7s. to 10s. bushel, 1s. to 2s. dozen. Pumpkins, 3s. 6d. to 5s. 6d. bag. Marrows, 2s. to 4s. 6d. dozen. Lettuce, 1s. 6d. to 3s. dozen. Cabbages, 6s. to 10s. dozen; inferior grades hard of sale to 3s. Beans, 4s. to 6s. sugar bag. Peas, 8s. to 10s. sugar bag; discoloured lines hard of sale.

CONVENIENT FARM GATE.

A wagon wheel with the rim and alternate spokes removed mounted as a turnstile makes a gate that is always open to people and always closed to horses and cows.

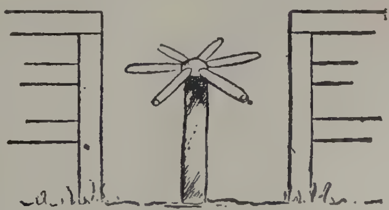
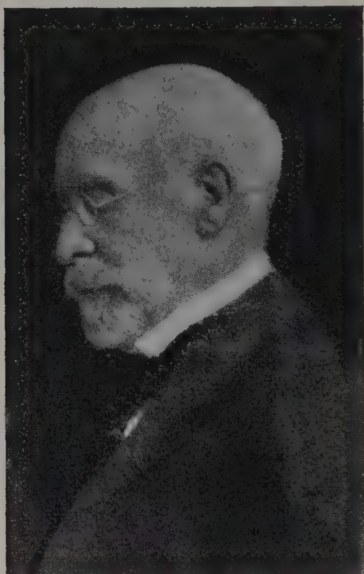


Plate 105.

In Memoriam.

E. H. RAINFORD.



Mr. E. H. Rainford, who died in Brisbane on 2nd February, was a very keen and able amateur naturalist. Those who have seen and admired the beautiful natural-colour collection of Queensland corals in the Museum will be interested to know that it was to Mr. Rainford that they were indebted for that presentation of a glimpse of one of the great natural wonders of the marine world, for it was his conception and the work of his skilled hands which gave it to them. Some of his corals also were sent to England and America.

In addition to this fine exhibit, the late Mr. Rainford also made a number of discoveries of new varieties of marine animals, some of them remarkable specimens, including new types of fishes and crabs which also are on view at the Museum. Mr. Rainford's name has happily been associated with some of these finds, thus permanently linking him with the work to which he gave so freely and so capably of his leisure.

The late Mr. Rainford was viticulturist in the Department of Agriculture and Stock from January, 1898, to December, 1903. He subsequently held other positions in the Department, and was for a number of years inspector under the Diseases in Plants Acts at Bowen. He retired from the Service in 1918.

Mr. Rainford was born in England in 1853. Before coming to Queensland he was engaged in viticulture and wine-making in Southern Italy for upwards of twenty-five years, and for seven years was manager of a large estate in Sicily belonging to Baring Bros. and Co., of London.

Amongst those who attended the funeral at Toowong Cemetery were representatives of the Department of Agriculture and Stock and the Queensland Museum.

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society and the Jersey Cattle Society, production charts for which were compiled during the month of January, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (STANDARD 350 LB.).				
Villa Maria Broady 5th (365 days)	W. Hinricksen, Ardilea, Clifton	12,362·75	624·597	Villa Maria Sir Charles
Duchess 10th of Oakvilla	E. O. Jeynes, Raceview	13,906·16	597·407	Victory of Greyleigh
Primrose of Trevor Hill	Geo. Gwynne, Umbiram	11,439·49	480·044	Prince of Braemar
Corunna Queen	J. H. Anderson, Southbrook	9,851·56	436·316	Viceroy of Wilga Vale
Corunna Dainty	J. H. Anderson, Southbrook	10,984·92	413·453	Gambol of Wilga Vale
SENIOR, 3 YEARS (STANDARD 290 LB.).				
Morden Sadie 8th	W. Hinricksen, Ardilea, Clifton	9,942·0	404·145	Jupiter of Morden
SENIOR, 2 YEARS (STANDARD 250 LB.).				
Laguna Melba	F. G. Lamkin, Moola, Dalby	8,619·27	368·107	Morden Marcus
Yuruga Greta	F. Hansen, Goodyer	10,212·65	366·564	Werona Vale, Tango
Valera Sheila 2nd	M. C. and A. M. Sullivan, Pittsworth	7,063·63	303·193	Blackland's Daphne's Boy
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Sunny View Nancy IV.	J. Phillips, Wondai	11,229·45	461·853	Burradale Byron
JERSEY.				
MATURE COW (STANDARD, 350 LB.).				
Linwood Blossom	F. W. Kath, Malakoff, *via* Dalby	7,873·88	412·369	Aerofoil of Banyule
Kelvinside Sparkling Eyes	L. J. Comiskey, Warra	7,128·86	376·869	Kelvinside Benedictine Nobility
Sun Jewel of Rosedale	J. Schull, Oakey	6,842·6	359·966	Oxford Prince Palatine
JUNIOR, 2 YEARS (STANDARD, 230 LB.).				
Kathleigh Royalette	F. W. Kath, Malakoff, Dalby	6,560·79	349·027	Retford Royal Atavist
Lermont Duchess	J. Schull, Oakey	4,668·4	275·227	Woodside Golden Volunteer
Lermont Myrtle	J. Schull, Oakey	5,403·25	272·96	Woodside Golden Volunteer
Bellgarth Babette	D. R. Hutton, Bellgarth, Cunningham	4,764·5	267·077	Trecarne Renown II.
Bellefaire Pride's Exhaltation	J. T. Richardson, Oakwood, Bundaberg	4,314·75	259·651	
Lermont Golden Bell (Twin), (268 days)	J. Schull, Oakey	4,363·05	249·192	Woodside Golden Volunteer
Bellgarth Birthday IV.	D. R. Hutton, Bellgarth, Cunningham	4,521·25	248·522	Trecarne Renown II.

The Tropics and Man

General Health.

Second Series: No. 8.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

A few years ago the term "general health" would often have aroused a feeling of mild and genial yet real contempt in a large number of conscientious scientists. The idea of thinking about such a vague thing as "general" health was not quite according to the rules. One could think scientifically perhaps about digestion, about heart-action, or even about pain, but to speak of "general" health was to hide one's ignorance of *real* bodily matters under a smoke-screen of words.

There were always, however, a few people who still considered themselves true scientists, but who thought and talked quite unashamedly about "general" health. They felt that the human body—in fact, life itself—is something more than a number of simple activities simply added together. They admitted, nay, even insisted, that to understand Nature you had to take her apart, as it were, to see what went on; but they also insisted that you were then only half-way to understanding her; that you had to put the parts back again and see, not only how they worked, but how they worked *together*.

In the previous articles of this series I have tried to take the human body to bits and to show you how the working of these bits was affected by hot climates. To complete this series I must put these parts back and say something about the working of the whole body—that is, "general health."

Tropical Detriments to Health.

The greatest danger to health in the tropics is undoubtedly that of transmissible disease, produced by virus, bacterium, or parasite. The climate and living conditions conspire not only to favour the spread of diseases occurring in temperate climates, but also to introduce diseases peculiar to the tropics. Transmissible disease is always, in the last analysis, preventable, but only too often economic, social, or even political issues prevent us from applying our full knowledge. The fact that it is preventable, and that as active measures as are humanly possible are being taken by authorities all over the world, is the bright spot in this aspect. For the reason that administration rather than scientific enquiry is the chief need in this field, I have not stressed this aspect in these articles.

Climate is usually considered to be the second chief danger to human health in the tropics. This idea largely dates from the scientifically dark ages when the cause and transmission of infective diseases was not understood. Inasmuch as a hot climate helps the spread of disease from one case to another, climate is, of course, a danger to health in the tropics. This charge is very often extended, however, to climate acting

directly upon the body. It is usually felt amongst British colonists (as distinct from Britishers in the Dominions) that even if infective diseases were abolished hot climates would still have a very bad effect upon the tropical dweller. To a certain extent that is true. In previous articles you will find references to the following ill-effects of hot climates:—Lassitude, irritability, loss of appetite, constipation, fatigue, muscle cramps, neurasthenia, heat exhaustion, reduction of work capacity, and reduction of mental productiveness. These occur, and they are due, in large part, to the direct effect of climate. They need not occur, however, to anything like the extent or with anything like the severity that they do. An understanding of their causes and the application of that knowledge along common-sense lines could go a long way towards reducing them to tolerable limits. One must realise that life in a tropical climate is different from life in a colder country. There is a limit upon activity; there is a reduced margin of safety over which one can maltreat the body with impunity. There is every necessity to enforce a reasonable adjustment of living conditions and habits to the new surroundings. So long as we preserve an attitude of mind which demands an unreasoning imitation of English Yuletide customs at the height of a Queensland summer, so long will we pay the consequences.

Economic and social disabilities must be ranked amongst the greatest dangers to human health and happiness in the tropics. Where worry and disappointment are continual companions, health can maintain but a precarious footing. Whether we like it or not, whether we agree with the system or no, the economic factor is the ruling consideration in continued life under the existing social system. Man can continue to live in a certain area only so long as he maintains a balance of assets over liabilities. No area of our tropical country can be populated unless the very large majority of the desired population can be assured of a reasonable chance of doing this. If the "natural" opportunities are insufficient to do this, then the question must be decided as to which is the least harmful—foregoing the settlement or providing artificial economic protection.

Isolation may mean little to the pioneer; he is made that way. Isolation may mean little to the grazier thoroughly interested in his work. Isolation, however, means a lot to the ordinary run of people whom we ask to settle on the land. Isolation may mean everything to the grazier's wife, cut off from her friends, social pleasures, and intellectual intercourse. How many people, having become used to the pleasures and comforts of city life, will willingly forego these to obey the urge to settle on the land unless reasonable amenities are provided? There has been far too great a tendency to think that anything is good enough for the country cousin. The feeling of frustration, of disappointment, and even of disillusion that is so frequently found in isolated communities is a definite, real, and constant danger to health. The psychological danger is reinforced by the material danger of dietary deficiencies in such areas.

Health Advantages in the Tropics.

While many diseases are more common in the tropics, there are others which are reduced in incidence or severity. Rheumatic fever and scarlet fever are two cases in point. Tuberculosis cases often do well in hot, dry climates, but a hot, humid atmosphere is not so beneficial.

Tuberculosis of the "bovine" type, which attacks the skin, bones, and glands is much less common in Queensland than in the Southern States. True childhood rickets is uncommon owing to the high incidence of sunshine. The free, open life is of the greatest assistance to children, permitting, as it does, of good exercise for the whole developing body. The beneficial effects of tropical residence show to their greatest advantage in the growing children; its burdens fall on the adult.

Getting the best out of the Tropics.

Take all that is good; avoid or minimise that which is bad! The first essential is a sensible attitude towards the tropics. In these articles I have tried to set out for you simple rules for life in the tropics, rules which are only common-sense deductions once the effects of hot climates are understood. The next essential is to see that you make the greatest possible use of every advantage. Do not aim at getting merely satisfactory conditions, make sure you get the best possible. The bank-balance of health can never be too high; you never know when the most serious demand may be made upon your reserves, and tropical circumstances are always placing a strain upon them. A third essential is to do everything in your power to see that your life is a full, happy and contented one. Contentment should not, however, be confused with complacency. You cannot get contentment until you have strived and won. Complacency is only another name for mental and moral laziness, a fatally easy habit to acquire in the tropics!

BALANCE OF NATURE.

A United States contemporary, *The American Cattle Producer*, publishes an editorial on the dire consequences that may follow ill-advised action in the wholesale destruction of animals and insects indigenous to the country. The particular trouble described started with coyotes, a species of wolf peculiar to and native of North America. These, it appears, have developed a habit of killing sheep, and at times even calves, so the Federal Government employs hunters to keep them down. It now transpires that in areas where the hunters have been particularly successful in their coyote elimination campaign, there has been a sudden increase in the rodent population. Rodents eat grass and are reported in such numbers as seriously to impair natural feed in certain districts—so much so that stockowners have sought Government assistance to relieve them of a new pest. At time of writing plans were being prepared for the carrying out of an extensive rodent poisoning campaign. *The Producer* asks, what will happen next? "If," it writes, "the poison is too profusely distributed by inexpert hands, is there not danger that useful birds will be destroyed in large numbers? If so, once the rodents are destroyed there may be a fresh host of enemies to combat." Our experiences in Australia certainly justify the sounding of the note of warning. The grasshopper plague that has afflicted large areas of pasture land during the past year or so can be attributed in part, at least, to the indiscriminate destruction of bird life. The same also applies to the blowfly pest. Nowadays, with the Council for Scientific and Industrial Research available to weigh and test pest elimination projects, there is not the same risk of nature balances being disturbed. Australia's task to-day is rather to readjust balances that have been upset by the introduction of rodents, plants, &c., which have multiplied beyond all expectations. It is on such work that the Council for Scientific and Industrial Research is now engaged. Government, for its part, is trying to guard us against the importation of new potential pests, and in that connection should receive the whole-hearted support of every individual in the Commonwealth. —*The Pastoral Review* for February, 1938.

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Barnyard Millet.

J.H.J. (Tamaree)—

The specimen is the barnyard millet (*Echinochloa crus-galli*). It has nothing to do with Sudan grass, and it is not a hybrid. It mostly grows in fairly damp situations and has a good reputation as a fodder grass. No poisonous properties have been attributed to it.

Stink Grass.

G.McC. (Millmerran)—

The specimen is the stink grass (*Eragrostis cilianensis*). Although cattle often avoid this grass, once they take to it they become fond of it. The best means of eradication would be hoeing before the seed sets. It is an introduced grass, native of India, Ceylon, and tropical Asia.

Portuguese Elm. Emu Grass. Carob Bean.

W.J.B. (Warra)—

Both tree specimens belong to the Portuguese elm (*Celtis sinensis*). This tree is extensively planted as a shade and fodder tree. The other specimen is a weed, *Psoralea tenax*, or emu grass. This is regarded as a fairly good native fodder plant. The carob bean does well on the Darling Downs. The young trees could be protected from frost if planted on low-lying land. We had not heard before that this tree is very susceptible to frost injury.

"Shepherd's Purse."

S. (Killarney)—

Your specimen has been identified as shepherd's purse (*Capsella Bursa-pastoris*). This plant is a weed in cultivation. It is not poisonous to stock and probably has a certain fodder value, but it may cause a taint in milk if eaten in large quantities.

Saffron Thistle, a Noxious Weed.

R.M. (Mundubbera)—

Your specimen has been identified as saffron thistle (*Carthamus lanatus*). This plant has been declared a noxious weed.

Gall Weed or Twin Leaf.

W.D. (Goondiwindi)—

The specimen of a weed from brigalow and belah country has been determined as gall weed or twin leaf, *Zygophyllum apiculatum*. We have no information as to whether this plant is poisonous, although it has come under suspicion recently as a possibly poisonous plant. As stock rarely touch it, it would seem to be at least unpalatable.

Wild Sorghum.

W. A. McD. (Mackay)—

The specimen is the wild sorghum (*Sorghum verticilliflorum*), a native of Africa, but now very common in many parts of Queensland, particularly along railway embankments, cultivation headlands, and similar places where the ground has been disturbed. A test by the Agricultural Chemist showed this to be one of the worst prussic-acid-yielding sorghums, and care should therefore be exercised in feeding it off. It is very similar to Johnson grass, but is somewhat bigger and coarser. We have seen both this and Johnson grass used on various occasions without any ill-effects following. The danger, of course, is always present.

White Cedar.

B. (Ayr)—

The specimens have been identified as the berries of the white cedar (*Melia dubia*). White cedar berries are well known to be very poisonous to pigs, and may be poisonous to fowls.

Button Grass.

M. Mc. (Wallangarra)—

The specimen is button grass (*Dactyloctenium radulans*), a native grass, very widely spread in Western Queensland, particularly in the sheep areas, and generally regarded as an excellent fodder. Like Flinders grass, it is quite palatable in the dry stage. It often grows with great abundance during the summer months, dying out with the approach of winter. It is very easily carried in the wool of sheep from one place to another.

Sour or Yellow Grass.

E.B. (Pomona)—

The specimen is *Paspalum conjugatum*, commonly known in Queensland as sour grass or yellow grass. In Hawaii it is known as hilo grass and also as mission grass. It is a native of tropical America, but is now widely spread throughout most tropical and sub-tropical countries. It has been established in Queensland for many years, particularly in the North, and during the past few years has established itself in Southern Queensland and parts of the Northern Rivers district of New South Wales. It is generally regarded as a poor fodder, and has given some cause for alarm in the wetter parts of the Atherton Tableland from its overrunning some country and reducing the carrying capacity of the paddocks in somewhat the same way as carpet or mat grass has in parts of the near North Coast. Wherever it grows, this grass has a poor reputation, although we have seen working mules fed on it very largely in New Guinea and work fairly well on it. It is a very common grass in the rubber and coconut plantations.

Needle Burr. Red Ash.

J.D. (Moggill)—

The weed is *Amarantsus spinosus*, needle burr. This is a very common tropical weed in North Queensland, and has spread as far south as the New South Wales border, but it does not seem as aggressive in the South as it is in North Queensland. Apart from its spiny nature, the plant is not known to possess any harmful properties. In India and tropical Asia, the green parts are generally used as a substitute for ordinary spinach.

The tree with the white under-surface of the leaves is *Alphitonia excelsa*, red ash, also known as silver ash or silver leaf, and sometimes as silver wattle, but should not be confused with the true silver wattle. This tree has a very wide distribution in Queensland, and is generally regarded as an excellent fodder. We have information, however, that stock in the Brisbane Valley will not take to it in the dry season when it is most required, although they will eat it in an ordinary season.

Evergreen Chloris.

T.H.C. (Gympie)—

Your specimen has been determined as evergreen chloris (*Chloris distichophylla*). This grass it a native of South America and it is cultivated in several parts of the State. It is palatable and nutritous, but tests made by the Agricultural Chemist show that it contains a prussic-acid-forming substance. Because of this, it would be advisable to exercise care in feeding the grass to stock.

" Devil's Claw."

C.E. (Stanthorpe)—

Your specimen is *Martynia proboscidea*, a native of Mexico, now naturalised in parts of Queensland and New South Wales. It is commonly called unicorn plant or devil's claw. When ripe, the green flesh of the fruit or seed capsule is split and the interior part bursts open in two long, strong claws. These sometimes get into the wool of sheep, particularly the heavy wool round the neck, causing breakages in shearing machines. An allied species with yellow flowers is common on parts of the Western Downs, and is sometimes known as pumpkin plant.

"Dog Burr."

W.D. (Goondiwindi)—

Your specimen is *Bassia tricuspis,* a species of roly-poly, a very common weed in parts of the Western Downs and Maranoa districts. It is closely related to the galvanised burr. We have not heard any distinctive local name applied to it, although we have heard it called "dog burr."

"Goathead."

W.A.K. (Clermont)—

There are two plants known as "goathead" in North Queensland, one *Bassia bicornis*—a somewhat upright plant—and the other *Tribulus terrestris*—a procumbent plant with yellow flowers followed by a mass of burrs, which break up into one-seeded pieces.

The former is not known to possess any poisonous or harmful properties. It is only found in Australia.

The latter has a very wide distribution over the world, and in South Africa is the cause of the trouble known as yellow pighead or tribulosis. It is one of those troubles that come under the heading of photosensitisation, and only the unpigmented or unprotected or little protected portions of the body are affected. The first symptoms noticeable are:—The animals rub the ears, face, and nose against stones, trees, or stumps, or scratch these parts with the hind legs. Within one or two days the animals appear depressed, and the eyelids, face, lips, and intermandibular organs are markedly swollen; the ears are about four times thicker than normally, and are drooping. After about the fourth to the eighth day, the swellings may extend down the ventral aspect of the neck and down to the throat organs, and are accompanied by discharges from the nose, eyes, and lips. Later the swellings almost disappear, and mummification of the skin of the affected parts sets in, causing the face to be hidebound and rendering movement of the jaws impossible. The disease may last from a few days to three weeks, or even longer.

Plants from Rockhampton District named.

M.R.I. (Rockhampton)—

(1) *Passiflora alba,* wild passion vine, a very common vine in Queensland, proved by Dodd to be poisonous to stock. The trouble is of an accumulative nature, and stock have to eat fairly large quantities of the vine over a considerable period before trouble is experienced. Most of the trouble occurs in dry seasons.

(2) *Abutilon auritum,* a very common shrub in some of the coastal parts of Queensland. It is not known to possess any poisonous or harmful qualities.

(3) *Solanum seaforthianum,* a native of tropical America, now naturalised in many parts of coastal Queensland. It is frequently known as "deadly nightshade." No feeding tests have been carried out with it, but we think it is safe to assume that the green tree is poisonous to stock. The burrs are reported to have been carried in by stock on various occasions. Fowls have been poisoned by them. Native birds, however, seem to eat the ripe fruits with impunity, because it is spread very widely by them.

(4) *Wikstrœmia indica,* tie bush, a very common shrub in coastal Queensland, and always regarded as very poisonous. Some time ago, feeding tests were carried out at Yeerongpilly by Pound. These gave negative results. The animals showed scours with traces of blood, but recovered when put on to ordinary feed. Later on Stewart carried out tests with the berries alone at Yeerongpilly on guinea pigs, and this showed them to be very poisonous. This latter test followed a report from Nambour that a child had eaten the berries with fatal results.

(5) *Alstonia constricta,* native cinchona or quinine, not known to possess any poisonous or harmful properties.

(6) *Cassia lævigata,* arsenic bush, a very common weed in Queensland. The local name is rather misleading. Like most species of cassia, however, it would probably cause scouring if eaten in any quantity.

(7) *Trema aspera,* poison peach. At times it develops a prussic-acid-yielding glucoside, but the presence of the glucoside in the plant is very transitory. We have known stock reported to eat this plant in very large quantities with impunity.

(8) *Tagetes glandulifera,* stinking rodger, a very common weed not known to possess any poisonous or harmful properties.

General Notes

This Month's Cover.

The block for this month's cover was made from a photograph by Mr. R. W. Lahey of a typical stand of Kauri pine in the Kirrima State Forest, North Queensland.

Staff Changes and Appointments.

Mr. E. J. Shelton, Senior Instructor in Pig Raising, has been appointed also an honorary protector under the Fauna Protection Act.

Mr. M. Moffat (Stapylton) has been appointed an honorary ranger under the Native Plants Protection Act.

Constable W. K. Fraser (Calen) has been appointed also an inspector under the Slaughtering Act.

Messrs. H. L. McDonald (Ormiston), G. King (Thorneside), W. Langdon (Cleveland), M. Bloomer (Wellington Point), and E. S. M. Attridge (Cleveland) have been appointed honorary protectors under "*The Fauna Protection Act of* 1937."

Diseases in Poultry.

Regulations have been issued under the Diseases in Poultry Acts relative to the registration of hatcheries and the conditions to be observed and performed by the owners of registered hatcheries.

Pure Seed Supplies.

The Department of Agriculture and Stock continues to receive numerous inquiries from farmers desirous of purchasing general seed supplies, who are apparently under the impression that the Department acts in the capacity of general seedsman. This is not in accordance with fact, as the Department does not enter into competition with established seedsmen.

Attention is given, however, to the pure seed supplies of tobacco and maize, both of which are produced on privately-owned farms in pure-seed propagation plots under departmental supervision. The control of tobacco seed supplies is essential in order to maintain purity and freedom from disease; and a somewhat similar position exists in regard to maize, as it is often difficult to procure pure high-yielding strains of approved varieties. An endeavour is made, therefore, to supply, in season, a small quantity of pure-seed maize to growers desirous of raising and selecting their own bulk seed for succeeding sowings. Farmers may rest assured that whenever seed of any description becomes available for sale or general distribution by the Department full particulars will be given by advertisement in the *Queensland Agricultural Journal* or by notification otherwise.

Farmers who require general farm seeds are advised to communicate direct with the nearest reliable seedsman from whom tested seed can be obtained.

Operation of the Seeds Act.

A Proclamation has been issued under "*The Seeds Act of* 1937" bringing that Act into operation as from the 20th January, 1938.

Regulations to give effect to the provisions of the Act have also been issued.

Mr. F. B. Coleman, Officer in Charge of the Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch, has been appointed Seed Specialist, Seed Analyst, and Inspector under the Seeds Act. Mr. R. A. Taylor, Inspector and Examiner under the Pure Seeds, Fertilisers, Veterinary Medicines, Pest Destroyers, and Stock Foods Acts, has been appointed a seed specialist during the absence at any time of the seed specialist, also seed analyst and inspector under the Seeds Act. Messrs. F. P. C. Bell and R. J. Holdsworth, inspectors under the Pure Seeds, Fertilisers, Veterinary Medicines, Pest Destroyers, and Stock Foods Acts, have been appointed seed analysts and inspectors under the Seeds Act.

Honey Board.

Orders in Council have been issued under the Primary Producers' Organisation and Marketing Acts giving notice of intention to extend the operations of the Honey Board from 9th March, 1939, to 8th March, 1944, and also providing that, from the election held about March of this year and thereafter, elections of growers' representatives shall be held triennially, and such representatives shall hold office for a period of three years.

Fruit and Vegetable Levies.

Executive approval has been given to the extension for a further twelve months, in each case, of the Stanthorpe Fruit and Vegetables General Levy Regulation and the Papaw Levy Regulations. These Regulations were issued in April, 1936, and were extended in December and January last, respectively.

Close Season for Mammals and Birds.

An Order in Council has been issued under "*The Fauna Protection Act of* 1937" repealing an Order in Council issued in November, 1935, under "*The Animals and Birds Acts,* 1921 *to* 1924," declaring all mammals (other than native bears) and all birds to be fauna to which the above firstmentioned Act shall extend and apply, and declaring the periods of close season throughout the State for the mammals and birds appearing in the schedule to the Order in Council. These are similar to those enforced under the Animals and Birds Acts.

The Fauna Protection Act.

"*The Fauna Protection Act of* 1937," which was passed during the last session of Parliament, is now in operation (as from the 1st January, 1938). This measure repeals "*The Animals and Birds Acts,* 1921 *to* 1924."

Dairy Inspectors' Examination.

An amendment of a Regulation under the Dairy Produce Acts provides that 70 per cent. of the marks allotted shall be sufficient to secure a pass in the practical portion of the examination for appointment as inspector under the abovementioned Acts instead of 80 per cent. as at present. A 60 per cent. pass in the theoretical section, as at present required, will remain in force.

Apples and Pears for Export.

At the recent annual conference of the Australian Apple and Pear Export Council, held at Sydney, it was decided that the following varieties of pears be placed on the recommended export list:—Beurre Hardy, Beurre D. Anjou, Beurre Bosc, Doyenne du Comice, Josephine, Packham's Triumph, Winter Cole, Winter Nelis, Madam Cole, Glou Morceau, Easter Beurre, Duchesse de Angouleme.

It was also decided that the following varieties be permitted export in 1938 only, and then to come up for review:—Black Achan, Howell, Marie Louise, Doyenne Bossuch, Lemon Bergamot, Vicar of Winkfield, Williams Bon Chretien, Winter Bartlett, Giblins Seedlings, Beurre Britton, Middleton, Kieffer.

All other varieties have been excluded from export.

Growers are asked to note the foregoing, so that the necessary re-working can be proceeded with.

In respect of varieties of apples for export, growers are advised to re-work with early red varieties.

Control of Banana Weevil Borer—Reward Rescinded.

The Regulation under the Fruit Marketing Organisation Acts authorising the Committee of Direction of Fruit Marketing to offer a reward of £5,000 for an effective scheme of treatment for the control of the banana weevil borer has been rescinded.

Registration of Hatcheries.

Regulations governing the voluntary registration of hatcheries have been prescribed. The object of registration is to combat pullorum disease (more familiar to many poultry raisers as bacillary white diarrhœa), and to maintain the standard of stock in respect of type and size of egg.

Before any hatchery is registered, it is necessary for the owner to submit the poultry on his premises to a blood test for pullorum disease, to undertake to eventually dispose of all birds which are carriers of the disease, and to maintain strictly his premises in a sanitary condition.

The registration of hatcheries is voluntary, but it is anticipated that owners of hatcheries will submit to the conditions governing registration in order that the purchaser of day-old chickens will have some reasonable guarantee as to their quality. As under the regulations blood-testing of the stock must be conducted by officers of the Department of Agriculture and Stock, breeders desiring to register should make early application in order that the staff of the Poultry Branch may be enabled to cope with the work entailed.

Boronga a Crossing Place for Stock.

An Order in Council has been issued under the Diseases in Stock Acts appointing Boronga to be a crossing place for stock from New South Wales. Mr. J. W. Carrigan (Brooklyn, Toobeah) has been appointed an honorary inspector of stock in connection with the duties at this crossing place.

Provisional Maize Board.

An Order in Council has been issued under the Primary Producers' Organisation and Marketing Acts, extending the operations of the Provisional Maize Board until October, 1938

Milk Board.

The Executive Council has approved, in pursuance of an indenture entered into on the 20th January last between certain producers and vendors of milk and the Secretary for Agriculture and Stock, that the following shall constitute the Milk Board provided for in that indenture, for the period as from the 17th February, 1938, to the 16th February, 1939:—

Mr. E. H. Lindsey (chairman).

Producers' Representatives.—Messrs. J. W. Latimer (Hill View, Yatala), J. A. McKnoulty (Jimboomba), and A. Clark (Loganholme).

Vendors' Representatives.—Messrs. R. H. Bentley (Metropolitan Milk Supply (G.B.) Ltd., Glenelg street, South Brisbane), W. E. Bell (Mayne View street, Milton), and G. Andrew (Chappel street, Petrie terrace).

Wild Life Protection.

Regulations have been issued under "*The Fauna Protection Act of* 1937" dealing with the issue of permits for trappers of fauna, the licensing of dealers in fauna and in opossum skins, and the registration of their premises.

The sale of any fauna or skins by an unlicensed person is prohibited, and penalties are provided for any breaches.

In addition to the payment of royalty on opossum skins, as was provided in previous legislation, a royalty at the rate of 10 per cent. on a prescribed valuation is now payable on all fauna taken within the State, either for the purpose of export beyond the boundary of the State or for sale within the State. This also applies to the sale or exchange of birds from aviaries.

Fees have been fixed for the issue of permits to bird trappers and opossum trappers, and for licenses for fauna dealers, skin dealers, and retail skin dealers.

The registration of aviaries is now provided for, and every person who is the owner of an aviary must make annual application for registration. No fee will be charged for this registration.

Generally, these Regulations are designed to provide more effective control measures for the protection of fauna in the State.

All-Australian Export Baconer and Porker Competitions.

Entry forms in connection with the second series of these competitions are required to be lodged with meatworks managements on or before the 15th April next, and entries should be forwarded to meatworks in time for them to be treated and shipped so as to arrive in London for judging on 15th July.

Pig producers are reminded that such competitions provide important publicity for Australian pig meats in the United Kingdom, and that the reports of the judges on individual entries are a valuable index to the producers concerned of their achievement and a guide to the type required in the United Kingdom market. Each entry should comprise three pig carcases, including heads, bred and fattened by the entrant. Only one entry of each particular breed or cross will be allowed from each entrant. The sire of the entry must be purebred and from a litter recorded by the Australian Stud Pig Breeders' Society. Weights for baconer carcasses should be not less than 120 lb. nor more than 160 lb. dressed and including heads. Weights for porker carcasses should be not less than 60 lb., nor more than 90 lb. dressed and including heads.

Prize money totalling £25 is awarded by the Australian Meat Board to successful entrants, and in addition, a trophy valued at £10 10s. is competed for. No entry fee is charged.

Entry forms are obtainable from the usual trade channels, also on application to the veterinary officers of the Department of Commerce in each State, and from the office of the board at 419 Collins street, Melbourne.

Rural Topics

The Flying Doctor Service.

This great work is increasing in value each year, a new "Flying Doctor" base having been established at Broken Hill by the New South Wales section of the Australian Aerial Medical Service in co-operation with the South Australian section. This is to provide medical facilities for settlers living within a radius of from 200 to 400 miles. By arrangement with Australian National Airways a suitable plane has been operating since June, and the station is now equipped, or will be shortly, with a powerful wireless installation.

Australian Aerial Medical Service is performing a national work without any attempt at profit, and has helped to revolutionise life in the outback country. Bases under its control have been set up at Port Hedland, Wyndham, Kalgoorlie (Western Australia), and Broken Hill, and it has a friendly interest in the station at Cloncurry (Queensland) conducted by the Australian Inland Mission. That one was the first in the Commonwealth and has been a great success. Should the project to equip a sixth station at Alice Springs eventuate, the sparsely populated areas of Australia will be brought within easy range of a flying doctor and hospital.—*The Pastoral Review.*

Buying "Chiller" Stores.

The chilled beef export trade calls for superior carcases, and buyers of stores for fattening are recommended to give attention to the following guiding principles:—

Body.—

1. The beast should be low-set. The short-legged beast always sells before and at a higher price than the "kangaroo dog" type. Leg beef is not wanted.

2. The body should be both deep and wide. Such bodies have the meat where it is wanted—i.e., in the region of the most expensive cuts.

3. Both top and underline should be straight, giving the body a box-like appearance. Roach-backed, slant-bellied beasts are not good "chillers."

4. The floor of the chest should be wide.

5. The ribs should be well sprung—i.e., more of the conventional heart than barrel-shape.

Head.—The short, broad head that usually goes with the well-bred animal is a good guide. The eye should be clear and prominent. Horns are not wanted.

General Appearance.—Uniformity in breed, size, colour, and quality are those selling features which constitute an even line and make for ready sale and top prices.

Every effort should be made to exclude from top lots cattle with unsightly brands, signs of disease—i.e., lumpy jaw, blind or suppurating eyes, limp, &c. The irregular feature in a few tends to mark down the value of the pen.

English Farm Boys.

Mr. Cyril Bavin, general secretary in charge of community services of the English National Council of the Y.M.C.A., stated recently at the Millions Club, Sydney, "that of more than 1,100 boys who were working on English farms, after being trained by his association, only 100 were willing to migrate to the Dominion. The reason was that wages and conditions of living in the farming industry of Britain were as good, if not better, than those obtained in Australia or Canada."

Mr. Bavin said that when migration ceased at the time of the depression, the scheme of training boys for farming in England was adopted, the intention being to build up a reserve of 1,000 youths who would be willing to go to the Dominions when migration began again.

"It seems," he said, "that the success of the scheme has defeated its objective. One boy asked me what wages were paid in Australia, and when I said he could get about 25s. a week with keep, his employer, who was standing by, said, 'Make up your own mind, Bill, but I am prepared to pay you 30s.' "

Of 1,300 boys trained and placed on farms by the association, Mr. Bavin said, 80 per cent. were still working on the land.—*The Pastoral Review.*

Horse Botflies.

At this time of the year horses may be greatly troubled by botflies. These flies are bee-like in appearance and possess two wings and a slender pointed abdomen. When laying eggs, the female fly hovers around the horse with the abdomen curved beneath the body. This has given the erroneous impression that the botfly stings, but its abdomen is held in this position merely to facilitate the deposition of its eggs. The eggs are laid on the hairs of the chest, throat, mane, shoulders, and legs of the horse, but more frequently on the hairs of the throat and the inside of the forelegs.

In time, the larvæ develop within the eggs and hatching occurs when the horse licks or rubs the spot on which the eggs are present. In some way or other, the hatched larvæ reach the mouth of the horse and then burrow into the flesh of the tongue and cheeks. Here they remain for a little while, but eventually make their way into the stomach. When fully grown they are passed out of the animal with the dung, burrow into the ground and pupate. In the pupæ the adult botflies are formed and they emerge after a period of a few weeks.

Botflies are harmful to horses in two ways. Firstly, the horse instinctively recognises them as enemies and makes desperate efforts to prevent the female botflies approaching and laying eggs. During the botfly season, horses thus become very difficult to manage in harness, and may also hurt themselves in their attempts to avoid the flies. Secondly, the bots in the stomach may cause serious trouble. Each bot has a pair of stout hooks in its mouth, and also rows of hooks around its body. These hooks irritate the lining of the animal's stomach, and may cause ulcers and other ill-effects.

Various methods have been devised to prevent the botflies from approaching horses and laying eggs. One of the simplest and most successful is a piece of canvas attached to the horse's noseband and headstaff, so that it covers the throat completely. Deep sheds or brush shelters also will give protection, as the botflies will not follow the horse out of the sunlight.

For the removal of the bots from the horse's stomach, carbon bisulphide is advised. This is given in a capsule after twenty-four hours' starvation at the rate of 6 cubic centimetres—about one ordinary teaspoonful—for every 250 lb. weight. The best time to treat a horse for bots is about May or June, for at this time of the year all eggs on the body will have hatched and, as no flies are about, the horse cannot become reinfested immediately after treatment.

—*Dr. F. H. S. Roberts.*

Dipping Sheep.

Dipping is the only successful method of freeing the flocks from lice and ked. For dipping a recognised proprietary material should be chosen and the directions for mixing followed implicitly.

Ordinarily, dipping should be done up to one month off shears or even earlier, but all shearing cuts should have time to heal before the sheep goes through the bath. A fine day should be chosen for the operation. Extremes of heat or cold should be avoided.

Sheep should never be dipped when in a heated state. Yard them, if possible, the night before.

Immerse the sheep completely. Allow them to drain and, if possible, dry in the shade. Avoid driving them long distances to paddocks after dipping.

Dipping pays, and, in addition, gives some protection against the blowfly.

—*J. L. Hodge.*

To Check a Bad Habit in Calves.

Skim milk-fed calves are often seen sucking each other after the buckets have been emptied. This bad habit should be stopped. Septic conditions, malformed teats, distorted udders, and early lactation in heifers may be traced to the habit of calf sucking calf. Either keep the calves away from one another by leg-roping until the taste of milk has dissipated, or feed them with meal—e.g., crushed or ground grain, pollard, bran, &c.—immediately after they have finished the milk.

Grooming of Dairy Cattle.

Grooming of dairy cattle is a refinement in farm management which calls for comment. High-producing animals are usually kept on high-priced farms, where natural scratching (or rubbing) posts—trees or stumps—have been removed. Frequent milking and stall feeding prevents during much of the day the natural function of self-licking. Both these small inhibitions have a marked effect on milk production, and it has been observed that, under these conditions, some grooming is decidedly beneficial.

Some Points for Poultry Farmers.

In poultry farming, culling serves two important purposes. By getting rid of the culls, all of the feed goes to the laying hens; and only the best hens remain in the flock to serve as future breeding stock.

Other sound points in poultry farming include care in the handling and marketing of eggs. Eggs are considered to be one of the most perfect foods for human consumption, yet in spite of that fact the quantity consumed by Queenslanders per head is extraordinarily low. Why more eggs are not eaten is probably because their regular dietary value is not more widely appreciated. There are other reasons, too; for instance, the delivery of eggs with dirt on the shells and the production of fertile eggs in hot weather. Clean nests, clean floors, and clean containers will soon overcome the dirt difficulty; while selling off all the male birds at the close of the hatching season is the answer to the other problem. Eggs should be gathered two or three times a day, and marketed at least twice a week in hot weather.

In looking after poultry, even with the best of care, we often overlook a very common source of trouble, and that is the house fly. Flies can go a long distance and carry germs and contamination from a diseased flock, or from microbe-infested filth. The industrious pullet will chase and catch flies just for the fun of it, and, at the same time, take in all sorts of germs or worms. So it would be wise to clean up every attraction for flies and spray the fowl houses just before cleaning them out. For general health reasons, apart from the requirements of the fowl run, it pays handsomely to swat the fly.

Risk of Feeding Raw Offal to Pigs.

On many farms a fat beast is killed occasionally for domestic use. Portions of the carcase and viscera are sometimes fed raw to pigs. These form a valuable pig food, if cooked; but, if fed raw, the health of animals may be endangered. For instance, when an animal is affected with tuberculosis, the primary lesions in the organs, being small, may escape detection. Although the carcase may not be grossly affected, there is a real danger to pigs—especially young ones—if fed with uncooked material from a diseased beast.

It is a serious offence under the Cattle Slaughtering Act, the Diseases in Stock Acts, and the Pig Industry Act to feed any meat, offal, or blood unless it has been completely cooked.

Shade for Pigs.

During the summer adequate shade for pigs should be provided. The ordinary sty, especially if it has an iron roof, is very hot, and some other shade is necessary in the heat of the day. If there are no trees near by, a wooden shed will answer the purpose. Another important aid to the health and comfort of pigs is a bath in which they can lie in hot weather. To wallow in the mud is the pig's natural method of cooling itself. Unfortunately, the wallow sometimes seen on the pig farm is a filthy puddle-hole. If there is infection of any kind in the yard, it is to be found in just such a place. Dirty wallows should be drained and filled in, and a concrete or similar bath provided. This can then be kept clean, and the liability to infection will be diminished. Comfortable and hygienic conditions are most important in maintaining the health and wellbeing of pigs.

Treatment of Cream.

In the present season of hot weather and thunderstorms dairy farmers are again advised to give close attention to the cooling, aerating, and stirring of cream. The flush growth of grass in the wet season often causes a gassiness in cream, as well as a "feedy" flavour. Aeration and cooling will do much to offset the development of these defects.

Variety in Livestock Feeding.

The flesh-forming materials in foods (proteins) are composed of units termed amino acids. These amino acids are synthesised by plants, but it is very doubtful whether they can be "manufactured" by vertibrates.

The most useful proteins are those which contain the greatest variety of amino acids. For this reason, animal by-products—milk, eggs, flesh, &c.—stand alone. If a vegetarian diet is to be persisted with, it must be selected from a wide range of foods so that the missing amino acids in one material way may be made up from another. This explains the benefits from variety in live stock feeding.

Rotational Grazing.

The practice of grazing paddocks throughout the year according to a pre-arranged plan of rotation—although highly successful in countries with a reliable rainfall—cannot be applied to the vast majority of Queensland dairy farms and pastoral holdings. The main object of rotational grazing—the regular provision of short, young grass—can, however, be achieved as far as weather conditions will permit by submitting each paddock to short and intermittent grazings, rather than to continuous stocking. In order that this practice of intermittent grazing may be applied in an efficient way, it is necessary to subdivide to provide a fairly large number of paddocks, each of which may be grazed down by the available stock within a short period and then rested.

Broadly speaking, the system of management recommended for dairy pastures is to concentrate the producing stock on a paddock of young, leafy pasture for a few days and when it has been eaten down fairly closely, transfer the stock to another paddock of young grass; and so on, coming back to the first paddock some weeks later, when good feed is again available on it.

Since the pasture in different paddocks will vary in its rate of growth, no definite orderly rotation will be possible, but each paddock will be grazed and spelled intermittently.

—*C. W. Winders.*

Crutching and Jetting for Fly Strike.

There is often controversy as to whether crutching or jetting is the better method of combating blowfly attack. There should be no argument on this score, for, with the increasing severity of fly invasion, both methods have their place in the protection of the flocks.

There is a school of thought which insists that the wool should be left on the crutch of the sheep and jetting alone resorted to. Other graziers pin their faith to crutching and will not consider jetting.

It is thought that, singly, both these methods are wrong to some extent, inasmuch as both methods should be used in conjunction. To get the greatest immunity from fly strikes, the grazier is advised to carefully crutch when—or before if practicable—the first fly invasion takes place. This should give the flocks immunity for about two months. Should further treatment be necessary, jetting the previously crutched sheep is advised. Thus with the intelligent combination of the two methods reasonable protection should be assured.

—*J. L. Hodge.*

Good Litter from Champion Sow.

The Tamworth sow Wattledale Lydia Pet, owned by Mr. J. Barkle, Sunnybank, winner of the championship in her section at the last Brisbane Exhibition, has since reared a litter which was inspected and check weighed under the supervision of the Department of Agriculture and Stock.

The litter was farrowed on the 25th August and numbered eleven pigs, three of which were lost during the first two days. The remaining pigs, which consisted of one boar and seven sows, were check weighed at fifty-six days old, when the following weights were recorded:—

Lb.: 55, 54, 57, 52, 51, 51, 44, 49. Total: 413 lb. Average: 51·6 lb.

WRENCH EXTENSION HANDLE.

A very useful tool for giving added leverage to double-end wrenches can be very easily made, as shown in the sketches. A piece of flat stock (A) is cut and

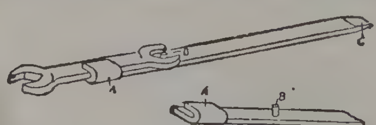


Plate 106.

bent over at the end to hook on the wrench, and a pin (B) is rivetted into it to bear against the jaw of the wrench, as shown. The other end of the tool (C), if made wedge or chisel-shaped, is handy for prising.

Orchard Notes

APRIL.

THE COASTAL DISTRICTS.

IN the Orchard Notes for March, the attention of citrus-growers was called to the necessity of their taking the greatest possible care in the gathering, handling, sweating, grading, and packing of the coming crop of fruit, as the returns for the labour expended in the upkeep of their orchards will depend entirely on the condition in which the fruit reaches the market. Many growers fail to realise the very important fact that the success of fruitgrowing does not depend merely on the proper working and management of the orchard, so essential for the production of a good crop of high-class fruit, but also upon the manner in which the fruit is handled and placed on the market. In no branch of fruit-culture is this more evident than in the case of citrus, as no fruit pays better for the extra care and attention, necessary to enable it to be marketed in the best possible condition. Every season there is a degree of loss in the consignments sent to the local and Southern markets, the percentage depending mainly on the weather conditions, the loss in a wet year being much heavier than that in a dry year.

A large percentage of the loss is due to what is known as blue mould—a rotting of the fruit caused by a mould fungus—and this loss can be prevented, provided necessary precautions are taken. Although this matter was dealt with last month, it is of such vital importance to our citrus-growers that it is necessary to again refer to it.

In the first place, growers must clearly understand that the fungus causing blue mould can only obtain an entry into the fruit through an injury to the skin; it will thus be seen that the remedy is to take every possible care not to injure the skin of the fruit in any way.

Few growers realise how easily the skin of citrus fruits can be injured, especially that of fruit grown under moist and humid conditions, when the skin is full of moisture and so tender that the least sign of rough handling causes serious injury. The cells of the skin are so brittle that they are easily broken, and when so broken a ready means of entry for the mould fungus is provided, and blue mould follows in due course.

The remedy for blue mould is in the hands of the grower, who must learn to gather, handle, and transport the fruit from the orchard to the packing-shed so that it does not receive the slightest injury, and, further, that when it has reached the packing-shed it must be carefully placed in shallow bins or on trays and be exposed to the air for at least seven days, so that the surplus moisture in the skin may be removed, and the skin thus become toughened and less easily injured. This drying of the skin is known as "sweating," and during the time the fruit is being sweated it should be kept under observation, and all fruit showing signs of blue mould or injury from fruit flies, sucking or boring insects, mechanical injury or bruising, should be removed.

In order to prevent injuring the skin when gathering, all fruit must be cut and not pulled. Gloves should be used to handle the fruit, and when cut it should be placed in padded baskets or other suitable receptacles. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to market.

For overseas or interstate markets only perfect fruit should be selected, and, further, it must be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case. The cost of cases, freight, and marketing is now so high that only the best fruit will pay to export, and even the best fruit must be properly graded and packed in order to produce the best returns.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention, for from now until the next rainy season the ground must be kept in a thorough state of tilth and free from weeds in order, firstly, to retain moisture in the soil, and, secondly, to enable birds, ants, and predacious insects to get at and destroy the pupæ of fruit flies and other pests harbouring in the soil.

Banana and pineapple plantations must be put into good order, and kept free from weed growth.

Land to be planted with trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land time to sweeten before planting.

Farm Notes

APRIL.

FIELD.—Those areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers must be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops, such as barley (skinless or Cape) and certain varieties of wheat may be sown during April. Growers of winter fodders will be well advised to study the article dealing with dairy fodder plots which appeared in February, 1922, Journal.

Potatoes should now be showing good growth, and must be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of Bordeaux mixture, a calm and somewhat cloudy day being chosen if possible for the spraying.

Where land has been previously well prepared, lucerne-sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad ''strike'' is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry. Succulent fodder of this description is the best possible form of insurance against drought, and for maintaining dairy and other stock in thrifty condition.

PROPAGATION OF GRASSES.

Frequently enquiries are received by the Department of Agriculture and Stock as to where seed of blue couch, Kikuyu, *Panicum muticum* (Para), and Guinea grass can be obtained. Kikuyu grass fails to set seed in Queensland, and little or no seed of commercial value is collected from stands of the other grasses.

Propagation is usually carried out with roots, runners, or plants, except in the case of Guinea grass, which is reproduced from roots or plants only, as it does not send out runners.

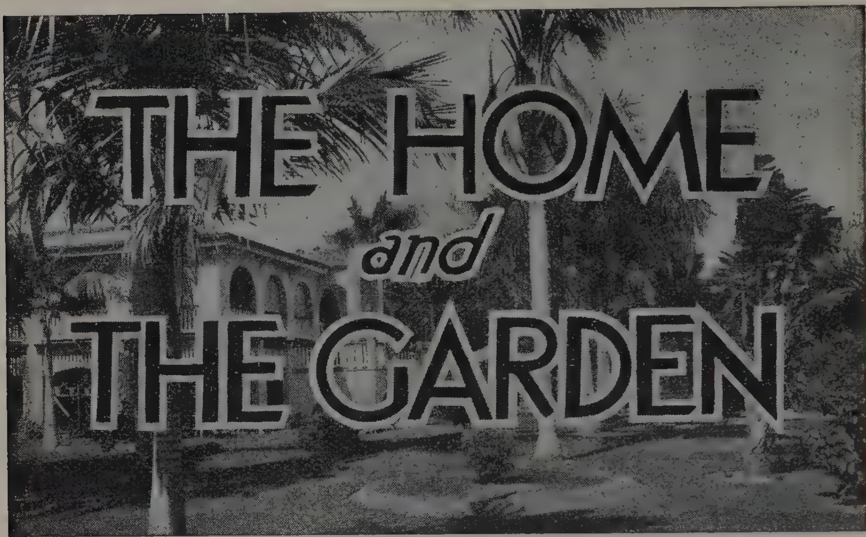
Supplies of the roots can best be obtained direct from the grower.

It is sometimes the practice to pass the runners of Kikuyu grass or Para grass through a chaffcutter set wide so that the resultant ''chaff'' can be broadcasted and harrowed in.

Blue couch should not be confused with the ordinary couch of Queensland, which can be grown from seed.

Plate 107.

Group of pupils from the Ashgrove State School on the occasion of an instructional visit to the laboratories of the Department of Agriculture and Stock.



Balancing the Diet.

(Contributed by the Queensland Nutrition Council.)

A GREAT authority on nutrition after investigating the diets of all types of people—rich and poor—was convinced that the majority of mankind lives on a diet which is defective in some respect. That does not necessarily mean that the majority of people are starving. Many people may and do eat more than enough food of a "kind," yet their diet may be defective in some one type of food constituent, i.e., their diet is not well-balanced. For example, in Australia, the people as a whole eat too much sugar and white flour and not enough fruit and vegetables, milk, and dairy products such as eggs and cheese. How then are we to balance our diets? Before we can do this intelligently we must know something of the different types of food constituents.

Foodstuffs, as commonly used, may contain all or some of the six essentials of any diet, viz.: water, carbohydrates, fats, proteins, minerals, and vitamins.

(1) *Water* is contained in most foods, even in solids, such as vegetables and fruit, bread, and meat, while good milk contains about 87 per cent. of water. Water is very essential to a well-balanced diet, and may be taken as "Adam's Ale," when at least six glasses daily would be needed, or as milk, tea, coffee, cocoa, or soups.

(2) The next essential is *carbohydrate.* These, together with the fats provide the body with energy and heat when digested. The carbohydrates should form about two-third of our daily food supply and include such substances as potatoes, fruit, vegetables, cereals, rice, sago, flour, and sugar. *Bread* consisting largely of flour is one of the most commonly used carbohydrate foods; indeed, according to modern knowledge, it is often too commonly used. Wholemeal or cerevite bread should always be used in preference to white—for they are both much richer in the sixth essential—vitamins.

(3) *The Fats.*—The third essential of a balanced diet mentioned above includes such substances as butter, fat of meats, cream, oils, and nuts, and here in Queensland should form about one-sixth of the total

quantity of the daily food supply. In cold countries, as in Northern Canada, the Esquimaux live almost entirely on seal and blubber of whale, which consist largely of fat. In tropical and temperate climates, during summer less fat is perhaps needed than during the winter.

(4) *Proteins* are the fourth essential of a well-balanced diet. These are usually known as body builders or strength-producing foods. Meat, fish, eggs, cheese, peas, and beans are foods rich in protein and these should form about one-sixth of the daily food supply. They are especially necessary for growing children. Men doing hard manual labour also require a good deal of protein, but our habits in Queensland already ensure a more than amply supply for working men.

(5) The *Mineral substances* come next among the essentials. Four important members of these are often deficient in the diet. These are —iron, lime, phosphates, and iodine. Iron is very necessary to keep the blood in a healthy state. Some of the foods which should be taken for their iron content are egg yolk, liver, whole-grain cereals, green vegetables, and dried fruits. Lime and phosphates are very necessary for the proper development of the bones and teeth, and also help in the formation of muscles and nerves. A lack of lime and phosphates and foods leads to many very serious conditions, especially in children. Milk, cheese, oatmeal, carrots, and potatoes are all rich in lime and should be included in the daily dietary. Of these, milk and cheese are especially valuable. For phosphates, foods such as milk, liver, brains, cheese, eggs, fish-roes, should have a place in a well-balanced diet. *Iodine*, too, is very essential in order to keep the body healthy. In districts where the food contains insufficient iodine, e.g., in certain parts of the Alps and in certain districts of New Zealand, a large percentage of the population develops goitre, a form of swelling in the neck. Oysters, cod-liver oil, eggs, potatoes (with skins on), and leafy vegetables, all contain sufficisnt iodine for the bodily needs.

(6) Now, the sixth and last essential of a well-balanced diet are *vitamins*, of which there are many. The most important of these are known as A, B, C, D.

From what has been said, it will be very obvious that milk, meat, eggs, and cheese, fruit and green vegetables, along with wholemeal or cerevite bread make a well-balanced diet. Attached you will find a table which will guide you in your choice of foods which, if followed, will provide both variety and balance in the diet.

BREAKFAST.

BALANCE YOUR MEAL BY HAVING ONE FOOD FROM EACH OF THE FOUR GROUPS.

(1) Fruit.	(2) Milk.	(3) Cereals and Breads.	(4) Proteins.
Orange Pineapple Apple Papaw Bananas Grapefruit Tomato Apricot Peaches Cherries Pears Grapes (Fresh fruit is best, but stewed can be used for a change)	Certified milk Pasteurised milk (Lower grade milks should be boiled before being given to children)	Wheat Germ Breakfast meal (*e.g.*, Cerevite) Stoneground wheaten porridge meal Firstbreak wheaten meal Cerevite bread Wholemeal bread Oatmeal (occasionally) ("prepared" breakfast foods are not economical)	Egg— Poached Scrambled Omelette Fried Boiled Lamb's fry Kidneys Fish Chops Steak Bacon Ham

LUNCHEON OR LIGHT EVENING MEAL.

BALANCE YOUR MEAL BY HAVING ONE FOOD FROM EACH OF THE FOUR GROUPS.

(1)	(2)	(3)	(4)
Protein Foods.	Salad, Vegetables and Fruit.	Starchy Foods.	Milk.
Mutton Lamb Beef Cheese Fish Ham Tongue Pork Veal Poultry Rabbit Pea soup Nuts	Lettuce Tomato Celery Apple and cheese Beetroot Pineapple and cheese Onion Shredded raw carrot Radishes Fresh fruit (as for break-fast)	Potato (boiled in jackets) Cauliflower Cerevite bread Wholemeal bread Macaroni	As for breakfast Milk soup

DINNER.

BALANCE YOUR MEAL BY HAVING ONE FOOD FROM EACH OF THE FOUR GROUPS.

(1)	(2)	(3)	(4)
Protein Foods.	Starchy Foods.	Vegetables.	Dessert.
As for lunch	Potatoes— Boiled in jackets Baked Mashed Other starchy foods as for lunch	Cabbage Lettuce Spinach Silverbeet Onions Carrot Cauliflower Tomatoes Parsnips Turnips Pumpkin	Fruit salad Pineapple Stewed fruits Custard made with milk and eggs

Australia, in fact the whole civilized world, is becoming nutrition-minded. Let us here in Queensland keep abreast in the forward march and introduce into our own homes a well-balanced diet. In this way, we may help materially in the building up of a strong and stalwart race, surpassing even our present high standard.

IN THE FARM KITCHEN.

MILK IN THE MENU.

To people of all ages, milk brings essential food constituents. The following recipes suggest attractive ways of introducing milk to the menu:—

Cod Steaks in Milk.

Take 1½ lb. cod steaks, 1 teaspoonful salt, 1 cupful milk, 2 tablespoonfuls flour, 1 small onion, 6 rashers bacon, sprig of parsley, pepper.

Wash the fish, dry it, and dredge with flour mixed with salt and pepper.

Place in a buttered baking dish. Sprinkle with chopped onion, then pour milk over. Bake in a moderate oven for fifty minutes. Fifteen minutes before fish is done, remove from the oven, place pieces of bacon curled up on top, and return for fifteen minutes. Serve sprinkled with parsley, in the dish in which fish was cooked. Thicken milk and serve in separate sauceboat.

Milk Coconut Puddings.

Take 1 pint milk, 3 eggs, 1 teaspoonful vanilla, 2 oz. castor sugar, 2 oz. coconut.

Beat eggs, sugar, and vanilla together for two minutes, then add the milk, and beat another two minutes before adding coconut. Mix slightly, then turn into four small pudding moulds, well buttered. Place in a pan with hot water coming half-way up the moulds, then cook in a slow oven. When set, turn out and top each with a small spoonful of jam.

Cream of Potato Soup.

Take 1 lb. potatoes, 1 small onion, 1 quart milk, 2 tablespoonfuls fat, 1 teaspoonful salt, 2½ tablespoonfuls flour, pepper to taste.

Pare potatoes very thinly and cook in enough water to cover until soft. Drain off the water and save it. Mash potatoes till free from lumps. Melt fat. Add onion cut into thin slices. Cook without browning until tender, then stir in the flour. When this bubbles all over add half a pint of milk and cook till it thickens, stirring constantly. Add mashed potatoes and stir till smooth. Stir in remainder of milk and one cupful of potato water. Season with salt and pepper and serve hot. If not quite free from lumps, the soup should be strained before serving.

Timbales of Pork.

Take ¾ cupful milk, 1 cupful cooked pork, ¼ cupful stale breadcrumbs, 2 eggs, 2 tablespoonfuls margarine, 2 teaspoonfuls minced parsley, salt, pepper, and paprika to taste, white or mushroom sauce to serve.

Melt margarine in a saucepan. Add crumbs and milk and simmer for five minutes, stirring constantly. Stir in pork, parsley, and lightly-beaten eggs. Season to taste. Pile in buttered individual dariole moulds. Place moulds in a baking tin of hot water. Cover with a sheet of buttered paper, and bake for twenty minutes in a moderate oven. Serve with white or mushroom sauce.

Creamed Salmon.

Take 1 lb. tin salmon, 2 boiled and chopped egg-whites, 1 tablespoonful butter, 1 cupful chopped peanuts, 2 tablespoonfuls flour, 1 pint hot milk, salt and cayenne pepper, buttered toast.

Melt the butter and flour together, and season it with salt and cayenne to taste. Add hot milk. Cook until smooth. Add salmon, flaked and free from skin and bones, peanuts, and chopped, hard-boiled egg-white. Make very hot and serve on rounds of buttered toast.

Semolina Sunflower.

Take 1½ pints milk, 4 oz. semolina, ½ oz. butter, 2 good tablespoonfuls sugar, vanilla flavouring, tin sliced peaches, chocolate hundreds and thousands.

Bring the milk to the boil, sprinkle in the semolina and cook until it is tender and the mixture quite stiff, keeping it stirred frequently. Draw aside, add the butter, and sugar, and vanilla to taste, and stir until dissolved. Turn into two small sandwich tins—the latter rinsed with cold water—and leave until set. Then turn out and arrange sliced peaches on each to resemble sunflowers. Put some chopped-up peaches in the centre and sprinkle it with chocolate hundreds and thousands. Serve with some of the peach, syrup and cream if liked.

Primrose Cream.

Take 1 pint milk, 2 egg-yolks, ¾ oz. gelatine, 1 dessertspoonful custard powder, ¾ gill cream, ½ gill water, 3 dessertspoonfuls sugar, crystallised flower for decoration.

Put the custard powder into a jug, and mix it to a smooth paste with a small quantity of the milk. Boil the remainder of the milk and stir on to it, Let it cool slightly, and add the egg-yolks (beaten). Stand it in a saucepan of hot water until it thickens, keeping it stirred occasionally. When ready remove jug from the hot water and leave until cold. Whisk the cream until it stiffens, gradually stir in the custard, and add sugar and vanilla. Dissolve gelatine in a saucepan with the water, strain it in, and mix together lightly. Turn into a wet mould, and, when set, unmould carefully and serve. Decorate the centre with a piece of crystallised flower or fruit.

Lemon Rice Shape.

Take 1 quart milk, ¼ teaspoonful salt, 1 teaspoonful lemon essence, 2 cupfuls rice, 3 tablespoonfuls castor sugar, berries to garnish.

Cook the rice, milk, salt, and sugar in the top of a double boiler till rice is tender. Flavour and turn into a border mould, dipped in cold water. Stand in a refrigerator till chilled, then turn on to a pretty glass dish. Fill centre with sweetened berries and serve.

Vegetable Soup.

Take 1 pint milk, 2 carrots, 2 onions, 1½ oz. margarine, 3 dessertspoonfuls flour, 1 turnip, ½ small stick celery, a few mixed herbs, pepper, and salt, 2½ pints white stock or water.

Prepare the vegetables in the usual way and wash them. Mince the onions and cut the other vegetables into fine strips. Melt the margarine in a saucepan, add the prepared vegetables, and cook them in it for a few minutes without browning. Draw aside, add the stock, a few herbs (tied in muslin), and seasoning to taste. Cook gently until vegetables are tender—do not leave the herbs in too long, or they will discolour the soup—then add the milk and thicken with the flour mixed to a smooth paste with water.

Creamed Tongue.

Take ¾ pint milk, 8 oz. cold diced tongue, 2 teaspoonfuls minced onion, 3 tablespoonfuls flour, 1½ teaspoonfuls minced pimento, 1½ oz. butter, 1 pint green peas, 1½ teaspoonfuls minced parsley, pepper and salt.

Melt the butter in a saucepan. Add flour, and, when the mixture froths, stir in the milk. Bring to the boil. Boil for five minutes, stirring constantly. Add onion and pepper and salt to taste. Boil two minutes, stirring all the time. Add tongue and pimento. Heat till piping hot, then stir in parsley. Serve on a hot dish in a border of green peas, boiled, drained, seasoned, and moistened with a little butter.

BIRDS IN THE GARDEN.

Thus "Waratah" in the *Sydney Morning Herald*:—

"In laying out my garden, I had in mind the need of a sanctuary for birds, and the necessity for providing some food for them. My garden was built half for the birds and half for my own pleasure," said an old bird-lover, a man of strong personality, who led an active and busy life, but whose thoughts invariably turned to Nature when the cares of business were past. His words have been indelibly imprinted on my mind.

They have been an inspiration in garden-planning, making the work so much simpler. They should also influence others in laying out their home plots, large or small, for it will be found, strangely enough, that what the birds require is identical with our own needs in a garden of our very own—privacy, shelter, shade, windbreaks, flowers for honey, berries which serve the dual purpose of food and decoration, fruits, and pleasant company. Are not these requirements between the birds and our own, in a garden, identical?

In return for these considerations, surely the presence of the little, swift-moving bodies somewhat tentatively returning our advances, and gradually gaining in confidence, is sufficient compensation—even it it entails a change of our original plans! Later, complete friendship may be gained, but it takes long and tactful overtures without mental reservations. Birds know their friends instinctively, and their confidence once obtained is a wonderful possession.

Quite apart from that, the wholehearted songs of the birds as spring approaches give us a rich feeling of comradeship. Who can resist the sweet warbling of the busy little blue wrens as they go around gathering insects; the virile song of the willy-wagtails; or the glorious love song of Jacky Winter, as he pours forth his call to a distant mate? No songster of older lands can surpass this humble little grey bird when he is in form.

Perhaps the most joyous note of all in the garden, and one which gives us the closest feeling of friendship, is the clear and vibrant call of the Eastern Thornbills. They live in a happy world, where food is abundant, and their gay and rippling song is infectious; like a clarion call, but mellifluous and softened, it greets us in all weather, whilst the quick-darting movements—now fluttering a-wing in the air; now upside-down as they gather in honey from the flower-cups of heaths, grevilleas, bottlebrushes, and correas—make us glad to have such company in the garden. It seems to have made a garden worth while.

PREVENTS GATE SAG.

Farm gates built without diagonal bracing never will sag if equipped with a turn-buckle as shown in the sketch. A longer bolt in the upper hinge serves to

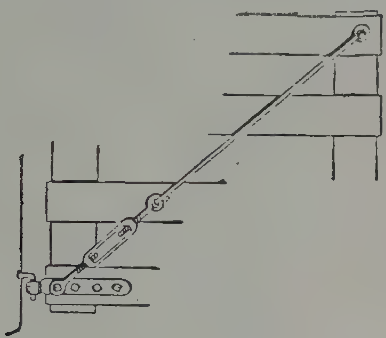


Plate 108.

fasten one end of the buckle. From the other end of the buckle a light rod or flat iron or No. 6 wire runs to the lower corner of the gate. Any tendency of the gate to sag is easily and quickly remedied by a few turns of the turn-buckle.

FOR THE WIRE GATE.

Instead of wire loops to fasten the free end of a wire gate, sections of an old auto casing can be used, according to directions in *Popular Mechanics.* These

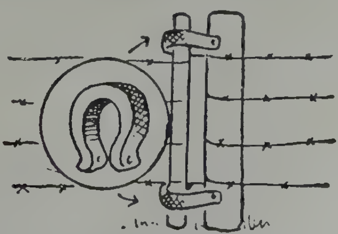


Plate 109.

are said to be flexible, easier on the hands, and quite resistant to wear.

Plate 110.

FERTILE FIELDS AND PASTURES.—Looking down the Canungra Valley from a spur of Tamborine Mountain, South Queensland.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of January, in the Agricultural Districts, together with Total Rainfall during 1937 and 1936, for Comparison

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of years' re-cords.	Jan., 1938	Jan., 1937.
North Coast.	In.		In.	In.
Atherton	11·83	37	10·81	5·87
Cairns	16·56	56	15·77	8·92
Cardwell	16·89	66	25·94	14·49
Cooktown ..	14·41	62	9·75	12·66
Herberton ..	9·56	52	7·75	4·32
Ingham	15·56	46	34 51	11·18
Innisfail	20·04	57	29·12	7·72
Mossman Mill ..	17·72	25	20·96	12·47
Townsville ..	10·89	67	15·19	5·52
Central Coast.				
Ayr	10·92	51	12·82	7·78
Bowen	9·88	67	2·83	1·57
Charters Towers ..	5·41	56	5·69	5·35
Mackay	13·93	67	4·70	2·81
Proserpine ..	15·52	35	6·89	5·06
St. Lawrence ..	9·23	67	0·91	5·20
South Coast.				
Biggenden ..	5·08	39	7·11	0·85
Bundaberg ..	8·55	55	9·73	3·61
Brisbane	6·38	86	7·70	1·57
Caboolture ..	7·46	51	11·17	2·10
Childers	7·27	43	7·48	2·73
Crohamhurst ..	12·04	45	19·95	2·11
Esk	5·65	51	8·21	1·17
Gayndah	4·57	67	4·30	1·89
Gympie	6·54	68	9·63	1·29
Kilkivan	5·46	59	3·79	0·62
Maryborough ..	7·02	67	8·44	1·45
Nambour	9·45	42	18·83	2·54
Nanango	4·57	56	6·89	1·43
Rockhampton ..	7·60	67	3·25	3·85
Woodford ..	7·64	51	13·74	1·33

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Jan.	No. of years' re-cords.	Jan., 1938.	Jan., 1937.
Central Highlands.	In.		In.	In.
Clermont ..	5·09	67	2·47	4·25
Gindie	3·63	39	..	0·64
Springsure ..	4·18	69	3·01	1·09
Darling Downs.				
Dalby	3·31	68	4·69	2·94
Emu Vale ..	3·20	42	3·74	2·01
Hermitage ..	3·15	32	..	0·79
Jimbour ..	3·45	50	4·56	2·33
Miles	3·62	53	3·55	3·56
Stanthorpe ..	3·64	65	3·06	7·58
Toowoomba ..	4·99	66	9·40	2·06
Warwick ..	3·54	73	4·85	2·57
Maranoa.				
Roma	3·06	64	4·47	1·86
State Farms, &c.				
Bungeworgorai ..	1·89	24	..	3·30
Gatton College ..	4·24	39	4·11	..
Kairi	..	..	..	..
Mackay Sugar Experiment Station	13·77	41	5·17	5·11

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—JANUARY, 1938.

Compiled from Telegraphic Reports.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.				Total.	Wet Days.
		Max.	Min.	Max.	Date.	Min.	Date.		
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·73	89	76	94	19	68	19	981	15
Herberton	..	84	65	92	3	59	18, 19	775	14
Rockhampton	29·82	92	74	102	7	68	19	325	14
Brisbane	29·90	84	70	95	21	66	27	770	16
Darling Downs.									
Dalby	29·87	90	67	101	2	61	8, 18, 26	469	8
Stanthorpe	..	81	61	93	3	49	8	306	9
Toowoomba	..	82	62	94	7	57	8	940	14
Mid-Interior.									
Georgetown	29·76	94	74	103	4	68	19	1,356	16
Longreach	29·74	102	76	111	1	70	24	122	5
Mitchell	29·82	94	70	110	2	56	9	426	5
Western.									
Burketown	29·73	94	79	105	8	70	20	591	11
Boulia	29·70	104	79	116	1	69	9	20	3
Thargomindah	29·76	98	75	114	2	61	9	93	2

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	March. 1938.		April. 1938.		MOONRISE. March. 1938.	MOONRISE. April. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	5 45	6·24	6·2	5 50	4·32	6 8
2	5·46	6·23	6·3	5·49	5·28	7·11
3	5·47	6·22	6·3	5·48	6·25	8·13
4	5·47	6 21	6·4	5·46	7·22	9·18
5	5·48	6·20	6·4	5·45	8·21	10 22
6	5 48	6·19	6·5	5·44	9·22	11·22
						p.m.
7	5·49	6·18	6·5	5·43	10·24	12·18
8	5 50	6·17	6·6	5·42	11·28	1·7
					p.m.	
9	5·50	6·16	6·6	5·41	12·28	1·51
10	5 51	6·15	6·7	5·40	1·27	2·33
11	5·51	6·13	6·7	5 39	2 20	3·13
12	5·52	6·12	6·8	5·38	3·10	3·51
13	5·52	6·11	6·8	5·37	3·55	4 26
14	5·53	6·10	6·9	5·36	4 36	5·4
15	5·53	6 9	6·9	5·35	5·15	5·44
16	5·54	6·8	6·10	5·34	5·52	6·25
17	5·54	6·7	6·10	5·34	6·31	7·8
18	5·55	6 6	6 11	5·33	7·8	7·53
19	5·55	6·4	6 11	5·32	7·48	8·41
20	5·56	6·3	6·12	5 31	8·29	9·32
21	5 56	6·2	6·12	5 30	9·13	10·24
22	5·57	6·1	6·13	5 29	10·0	11·15
23	5 57	6·0	6·13	5 28	10 49	..
						a.m.
24	5·58	5·59	6 14	5·26	11·41	12·9
25	5·58	5·58	6·14	5·25	..	1·5
					a.m.	
26	5 59	5 57	6·15	5·24	12·34	1·59
27	5·59	5·56	6·15	5·24	1·27	2·55
28	5·60	5·55	6·16	5·23	2·20	3 53
29	5·60	5·54	6·16	5·22	3·16	4·53
30	5·61	5·53	6·17	5·21	4·9	5·57
31	5·61	5·52			5·9	

Phases of the Moon, Occultations, &c.

2nd	Mar.	●	New Moon	3 40 p.m.
9th	„	☽	First Quarter	6 35 p.m.
16th	„	○	Full Moon	3 15 p.m.
24th	„	☾	Last Quarter	11 6 a.m.

Perigee, 11th March, at 6.0 p.m.
Apogee, 24th March, at 7.0 a.m.

From the 18th to the 20th the three planets—Venus, Mercury, and Saturn—will be remarkably close together in Pisces; but when this rare grouping might have been observed, Mercury and Saturn will be too near the horizon to be seen with the naked eye. Venus, in its wonderful lustre, setting later, cannot be missed. Indeed, the reappearance of the beautiful planet is the most fascinating event of the month.

On the 21st of March, at 5 p.m., the Sun will pass from south to north of the equator, and our Autumnal Equinox will occur. The Earth's axis will be neither turned towards nor away from the Sun, and both hemispheres will receive the same amount of light and, as the Earth rotates on its axis in twenty-four hours to bring it alternately into light and darkness, day and night will then be of equal length all over the world.

Mercury rises at 5.5 a.m., 40 min. before the Sun, and sets at 6.12 p.m., 12 min. before it on the 1st; on the 15th it rises at 6.20 a.m., 27 min. after the Sun, and sets at 6.30 p.m., 21 min. after it.

Venus rises at 6.12 a.m., 27 min. after the Sun, and sets at 6.47 p.m., 23 min. after it on the 1st; on the 15th it rises at 6.35 a.m., 42 min. after the Sun, and sets at 6.41 p.m., 32 min. after it.

Mars rises at 8.56 a.m. and sets at 8.25 p.m., on the 1st; on the 15th it rises at 8.46 a.m. and sets at 8.0 p.m.

Jupiter rises at 3.58 a.m. and sets at 5.13 p.m. on the 1st; on the 15th it rises at 3.17 a.m. and sets at 4.29 p.m.

Saturn rises at 7.36 a.m. and sets at 7.43 p.m. on the 1st; on the 15th it rises at 6.48 a.m. and sets at 6.52 p.m.

During this month, from about 9 o'clock at the beginning and two hours earlier at the end, the finest of the southern and northern constellations are seen to greatest advantage in and near the Milky Way. With a good field-glass beautiful star groups may be found, especially near Argo, above the Southern Cross, where the Milky Way is most luminous.

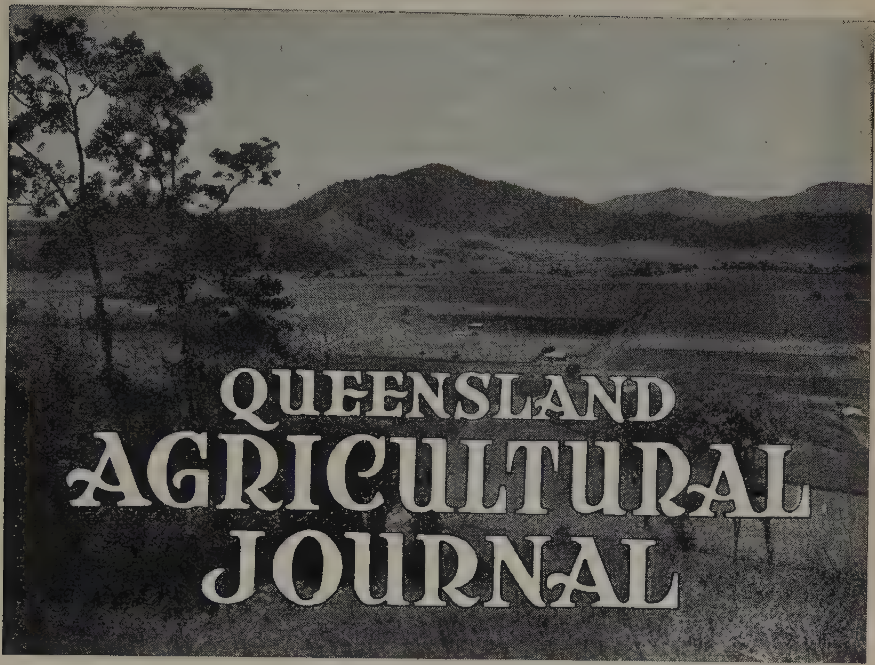
1st	April	●	New Moon	4 52 a.m.
8th	„	☽	First Quarter	1 10 a.m.
15th	„	○	Full Moon	4 21 a.m.
23rd	„	☾	Last Quarter	5 14 a.m.
30th	„	●	New Moon	3 28 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



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Event and Comment

Agricultural Development in Queensland.

IN the course of a recent statement the Minister for Agriculture and Stock (Hon. Frank W. Bulcock) said that to-day it could be clearly recognised that agriculture had entered on the third phase of its development. Successively these stages were the pioneering era, the production era, and the production plus selling era.

In the second stage it was only necessary to produce a crop to be able to sell it, and disposal was the only objective. In this period such things as quotas and limitations were unheard of, but equally also was the factor of a fair price for the commodity. In other words, the producer had no guarantee that he would receive the cost of production. This period was a far happier one for the speculator and middleman than for the producer.

Then, because of a variety of circumstances, the new alignment of production began to manifest itself. Not only did the farmer have to produce a crop, but he had to sell it under increasing difficulty. The old system of individual bargaining could not meet the new demands made on it, and economics was wedded to agriculture, and the sun of organised marketing cast its glow upon the horizon. Queensland was the first State in the world to recognise that organised marketing was essential for a well-balanced State economy, and, as a result, the first experimental orderly marketing legislation was introduced. This was "*The Wheat Pool Act of* 1922," sponsored by the late W. N. Gillies, in his capacity of Minister for Agriculture. Although ridiculed and reviled by a

certain section of the public, its very success secured its permanent place on the statute-book. The present Premier, Mr. Forgan Smith, followed Mr. Gillies in the Department of Agriculture, and under his guidance and care the general orderly marketing of agricultural products took definite shape. The principles laid down in the relevant legislation had never been disturbed. These were farmer control of products, farmer responsibility for satisfactory marketing, and the maintenance of a due balance between producer and consumer.

For years Queensland stood alone in respect of orderly marketing. Then came economic nationalism, with its sure and certain repercussion on Australian agriculture, and other States and other countries, in a frantic search for a solution of the very real difficulties besetting the producer, finally focussed attention on the Queensland system, which, introduced some years earlier, had gained wisdom by experience and made a success of the venture. Then followed a period when other States adopted the principles laid down by Queensland in organised marketing, and the seeds of economic security were scattered over a continent. Some fell on stony ground, but some bore fruits much more palatable than the autumn fruits of "go as you please" marketing. Then other countries, chief of which were the United States of America, Canada, and the United Kingdom, introduced legislation fundamentally the same as that existing in Queensland. Where variations in practice were introduced, the basic principle laid down in Queensland was, in all cases, adhered to. The torch lit in Queensland had thus cast its rays far beyond our shores.

The Empire Producers' Conference.

THIS was substantially the position when the Empire Producers' Conference met in Sydney in the last week of March, the Minister continued. Obviously, the major problem confronting the gathering was in relation to United Kingdom markets. Each Dominion desired, naturally, to conserve to the utmost its present and potential markets in that country. On the other hand, it was the obvious duty of the United Kingdom delegates to preserve British agriculture and to ensure that any agreement reached would not prejudice home producers on their own home market. It could, perhaps, have been made clearer to the British representatives that we in Australia would not venture to criticise British agricultural policy, nor had we ever done so, but we had just as consistently required that our agriculture should not rank second to foreign countries. Past happenings had, at times, made us apprehensive that we were not regarded as occupying second place, giving way only to Britain, and if the restatement of the Ottawa principle, agreed to by the conference, was productive of a clearer understanding, then the conference might be regarded as having been eminently successful. The declaration of the conference might prove valuable in view of the revision of the Ottawa Treaty in the near future. Reading between the lines, it was evident that certain delegates feared that, in its early stages, the conference was being steered towards restriction of production. In certain quarters this principle had been regarded as a solution of agricultural difficulties, and if restrictions had finally been abandoned, then surely once again the air had been cleared for closer understanding.

We had now come to a consideration of the actual decisions taken by the conference. These might be briefly stated as providing for the establishment of Federal and Empire Agricultural Councils, organised

on a commodity basis, whose duty would be to achieve orderly marketing. The meaning of orderly marketing must, of course, be comprehensive. It was frankly difficult to define it in exact terms, and even more difficult to achieve it on an international plane. There were so many cross-currents, the force of which could not be estimated at the Sydney gathering. For instance, to what measure would Imperial policy conform to the recommendations of the proposed councils and—coming closer home—what degree of harmony would exist between them and the Australian Council of Agriculture? It must be remembered that the proposed boards would be purely advisory in practice, and that their success would depend on the active support of the British Ministry.

It was there, added Mr. Bulcock, that the canker of suspicion had entered into his mind. He had read that the conference was urged to agree to certain things, lest Governments did certain things not at all pleasant. In short, the conference agreed to certain steps being taken, and he wondered if there were not a distinct danger of the British representatives on the boards endeavouring to present British policy, and so relieve the representative of the Government of the United Kingdom of certain responsibilities. In other words, the function of government could not be taken over by the boards, and we in Australia would be unwise indeed to surrender any of our negotiation rights to boards, whose endeavour may not be in the best interests of Australian agriculture. We had nailed certain principles to the mast in Imperial negotiations. The most important was that we could not agree to a policy of restriction of production. Our national safety and development depended on increased population and a virile land policy. This must mean expansion—not contraction—of production, and established markets were essential.

If this fundamental of our agricultural faith were agreed to generally, then he predicted a very useful work for the Empire Agricultural Councils. The task would be to distribute our goods properly in the most satisfactory way. That regulation of arrivals of beef, lamb, and butter was essential went without saying, and the real task of the Empire Marketing Councils must be to spread production over markets and periods, to the mutual advantage of both producer and consumer. Those were the tasks that had always confronted agriculture during the "economic era." If a new and virile body were to be created to carry some portion of the burden, to smooth out the road, and to serve agriculture and the State, then he felt sure that such a body would receive a very hearty welcome when established, and earnest support and help in its endeavours.

That earnest and loyal support for Australian agricultural policy was essential must be evident to all people who had studied the ever-increasing difficulty of markets. So long as economic nationalism struck a dominant note in world economics, our reliance on the United Kingdom market must continue.

Concluding, the Minister said that everyone knew that there had been times when the understanding between the British farmer and the Australian producer had left much to be desired. The coming of a distinguished body of British farmers to Australia, the opportunities that had been presented for exchanging viewpoints and discussing marketing, must promote understanding and stimulate sympathy with us in our problems. The result should be a strengthening of mutual respect and a knowledgeable approach to the difficult questions that still awaited solution.

A Note on Pollination and Fruit Setting of the Granadilla.

L. G. MILES, Ph.D. and J. W. J. AGNEW, Bureau of Tropical Agriculture, South Johnstone.

IT is widely known among farmers and householders in North Queensland that under natural conditions, fruit setting of the granadilla *Passiflora quadrangularis*, L., is irregular, and totally unsatisfactory. It is generally assumed that some form of hand pollination is necessary to ensure a satisfactory crop of fruit.

H. F. MacMillan, in "Tropical Planting and Gardening," makes the statement: "The flowers are generally pollinated by insects, but these should be aided by artificial pollination in order to ensure a good crop of fruit." No suggestion is made, however, as to whether self- or cross-pollination is advisable, or as to the stage of flowering at which pollination is most effective.

It was therefore decided to lay out a simple pollination experiment at the Bureau of Tropical Agriculture, South Johnstone, during the summer of 1937-38.

Floral Characters and Development.

The granadilla flower (Plate 111) is large (three to four inches in diameter when fully opened), strongly scented, and of very attractive appearance. The flower is subtended by three leafy bracts below a calyx of five large fleshy sepals. The petals are also five in number, fleshy, and similar to the sepals, but purple tinted. Arising from the base of the corolla is a continuous fringe or crown of long, varicoloured filaments. Normally there are five stamens, (though four have frequently been found), comprising short thick filaments and large anthers opening longitudinally down the centre. The ovary is surmounted by three separate styles (occasionally two or four), with large, lobed stigmatic surfaces.

Floral development takes place very rapidly. Unopened buds one day will give rise to fully opened flowers the following day, which will have closed again the same evening. Flowers open during the early morning hours, the styles of the newly opened flowers being semi-erect, and the anthers dehiscing rapidly in warm sunlight. During the day the styles become horizontal, then turn downwards and direct the stigmas towards the base of the flower. Although this movement brings the stigmas within the region of the anthers, natural pollination of all three stigmas was never observed. Occasionally portion of one stigma might come into contact with exposed pollen, but more frequently the stigmas encountered the backs of the anthers or failed to touch them altogether.

Another remarkable feature was the absence at all times of pollinating insects. Bees and other nectar-gathering insects were actively engaged on banana flowers in a near-by plot, but none was ever observed "working" the granadilla flowers in spite of their attractive colouring and scent. A probable explanation of poor fruit setting under local conditions is thus apparent.

During the latter part of the day the styles become limp and flaccid, the stigmatic surfaces turn brown to brownish black, and the flower

droops and closes. The young fruit develops rapidly, and the floral parts gradually wither away, their remains adhering to the stem end for a considerable time.

Plate 111.
Granadilla flower at full maturity, showing relative position of stigmas and anthers.

Experimental Procedure and Results.

With the main purpose of determining the most satisfactory method of pollination, sixteen one-year-old vines were selected for experiment, Four different treatments were originally chosen, each replicated in four randomised blocks.

The treatments were as follows :—

A. Hand cross-pollination; removal of the anthers after opening of the flower, and fertilization with pollen from other vines.

B. Untreated; subject to natural self-pollination or to open pollination.

C. It was originally intended with this treatment to ascertain whether or not the anthers matured before the stigmas were receptive; it was therefore planned to tag flowers on opening, and pollinate them at a fixed time later with pollen from freshly opened flowers on the same vine. As, however, the stigmas were observed to wilt and discolour frequently in less than 12 hours, the plan was revised and the two treatments C_1 and C_2, substituted.

C_1. Hand pollination in the bud, just prior to opening, with pollen from opened flowers of the same vine.

C_2. Hand selfing immediately on opening of the flower.

D. Hand selfing at full development of the flower (4 to 6 hours after opening).

Approximately equal numbers of flowers were treated in each vine unit, the number being limited to about 40 by the productivity of the less vigorous vines; percentage set of fruit was determined in each case.

Detailed results per vine are given in Table 1, while Table 2 summarises the mean treatment effects, after subjecting the data to Analysis of Variance.

TABLE 1.

VINE UNIT YIELDS (FRUIT SET PER CENT, FLOWERS TREATED).

—	A	B	C_1	C_2	D	Total.
Block 1	7·9	0·0	0·0	39·1	30·3	77·3
Block 2	16·1	15·6	0·0	35·7	70·0	137·4
Block 3	9·7	0·0	0·0	69·0	44·1	122·8
Block 4	4·5	0·0	7·1	45·5	17·1	74·2
Total	38·2	15·6	7·1	189·3	161·5	411·7

TABLE 2.

MEAN PERCENTAGE FRUIT SET WITH VARIED POLLINATION TREATMENT.

Treatment.	Mean Per Cent. Set.	Significantly Exceeds.
C_2	47·3	A, B, C_1
D	40·4	A, B, C_1
A	9·5	..
B	3·9	..
C_1	1·8	..

The results indicate that pollination in the bud, open pollination and controlled cross-pollination were totally unsatisfactory in inducing fruit setting, while artificial self-pollination immediately after opening or up to 4 to 6 hours later yielded markedly better results. It is disappointing that even these latter treatments resulted in only 40 per cent. to 50 per cent. fruit setting, but under the prevailing conditions of alternating extreme heat and heavy downpours, this percentage may be considered reasonably satisfactory.

Discussion.

The surprising feature of the results is the failure of cross-pollination as compared with self-pollination in promoting fruit development. W. Popenoe, in his "Manual of Tropical and Sub-tropical Fruits," suggests that the granadilla and other Passifloras may be self-sterile, and that "if insects are lacking to do the work, cross-pollination must be effected by hand." The South Johnstone results are certainly at variance with such a claim.

In order to further check the efficacy of self-pollination as compared with cross-pollination, a second trial was made during a flowering period in early January. Alternate flowers were artificially selfed and crossed, using parallel technique throughout, until rain put a stop to the series. Protracted heavy rain adversely affected fruit setting, with the result that only 15.3 per cent. of the selfed flowers and 6.9 per cent. of those crossed set fruit. Even if this difference were statistically significant, the percentages are too low to possess practical significance. The result can merely be said to slightly corroborate that obtained in the main experiment.

The reason for this discrepancy in the results of self- and cross-pollination is not yet apparent. All fruits produced in these trials as a result of either self- or cross-pollination were well provided with seeds, and showed no evidence of defective fertilization. Self-fertility has certainly been demonstrated by the data obtained, but cross-sterility would not be expected among plants so closely allied as those in question. Further studies will, however, be directed towards the elucidation of this problem.

Citing Paul Knuth, Popenoe also refers to protandry in the Passifloras, i.e., the maturity of the pollen bearing organs before the stigmas of that flower become receptive. The South Johnstone observations on the early wilting and discoloration of the stigmas coupled with the comparative success of self-pollination immediately after opening tend, at first sight, to refute this statement.

Considering, however, the rapidity with which anthesis proceeds, it may still be possible that the pollen loses its viability within a few hours after the anthers dehisce, and that the stigmas of many flowers are not fully receptive till subsequent to this time. If such were the case, best results would be obtained when flowers opened some time, but (prior to wilting of the styles), were treated with pollen from freshly opened flowers on the same vine. This possibility will be investigated concurrently with the further study of self- and cross-fertility, the advent of the current wet season having set a period to work of this nature.

Summary.

Under conditions prevailing on the tropical coast of Queensland, fruit setting of the granadilla (*Passiflora quadrangularis*) may be almost a complete failure unless artificial pollination is resorted to.

It has been shown that a satisfactory set of fruit can be obtained as a result of merely self-pollinating open flowers during the morning of opening.

The occurrence of protandry has not yet been demonstrated, and data obtained show that its effect at least is not highly important. Whether still better fruit setting can be induced by using pollen from younger flowers on pistils of older flowers of the same vine, and if so, whether such a method will be practicable, remain to be proven.

Self-pollination may be effected by simply transferring pollen from the open anthers to the stigmatic surfaces with a small camel-hair brush. Alternatively, a small round stick of soft pine sharpened to a pencil point may be used to transfer the pollen. Care should be exercised, however, to avoid injury to the stigmas when smearing the pollen over their receptive surfaces.

Evaluating the Sire.

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SINCE the sire represents half the herd, it is obviously just as essential to have some means of measuring his potentialities for production as for ascertaining the influence of the dams. While this article deals primarily with the question of a bull indexing in dairy cattle, there is scope for the application of the progeny test to other types of live stock, for example, litter size in pigs, rate of fattening in pigs or lambs.

Introduction.

Under present economic conditions and keen international competition for the markets of the world it behoves all nations dependent on primary industries for their national income to ensure the highest efficiency in economical production.

Owing to climatic disabilities and distance from the principal markets this applies with particular force to Australia in general and Queensland in particular. Our supremacy in wool is undoubted, but the position is not nearly so satisfactory with regard to beef, mutton, and dairy produce.

Economic production means maximum production at minimum cost, and while at present a suitable yardstick is lacking for measuring this in the case of beef, mutton, or pork, a simple and accurate one is available when it comes to milk and butterfat production. Improvement along these lines has been the aim of breeders for the past hundred or more years, and too much praise cannot be given to our stud masters, past and present, for the wonderful improvement which has occurred in our milking cattle.

In the early days selection was based solely on type, whilst later pedigree was considered all-important. The next big step in improvement, and an accurate measure of the value of females, was the introduction of herd-recording. This lastmentioned showed that type alone was not a satisfactory basis on which to judge the value of a cow, as careful compilation of records indicated that many cows which would never win a prize in a show ring were nevertheless among the leaders in production, while cows awarded championships were by no means always the best producers in a herd. Pedigree alone is also an unreliable guide to the value of an untested animal, although when used rationally it is a valuable aid to the breeder. Its greatest drawback is the fact that frequently all that is available is a list of ancestors, with no indication of their performances, or of only selected ones, while too much emphasis is frequently placed on some outstanding animal far back in the line of descent. Herd recording has been a most valuable guide to economic production, and it is an absolute essential to efficient dairying. Without it no dairyman can possibly be in a position to say whether his individual cows are an asset or a liability.

Even with this advance, however, a measure of half the herd only is available, since production records apply solely to cows, and the bull is rightly regarded as being the other half. Owing to his anatomical and physiological make-up, we have no direct method of measuring his true worth, for, of course, he does not produce milk. This handicap was

recognised many years ago, and, following the introduction of herd-testing schemes, the selection of the bull was based not only on type and pedigree, but also on the production of his dam. It was quickly realised by students of genetics that this was subject to serious drawbacks, since, unless the animals were directly inbred, the dam would be responsible only for 50 per cent. of the make-up of her offspring, and 25 per cent. of that in the progeny of her son. This led to an endeavour to obtain a more accurate measure of the value of a bull in a herd, giving rise to the evolution of progeny testing and the bull index system.

As an indication of the importance attached to bull indexing in the United States of America, the Year Book of Agriculture (United States Department of Agriculture) states that "Recommendations for the use of proved sires for herd improvement are now general (in America), and the logic of the procedure seems irrefutable."

Correcting Production Records for Age.

Obviously a common age standard for production is essential before any comparison can be made between, for example, a two-year-old and a five-year-old cow. It is common knowledge that a cow's production, under constant conditions, shows a steady increase up to the age of six to eight years at least. In order to arrive at a commensurate basis for production standards in herd recording, the figures for production of large numbers of animals at various ages from two years to six years were taken and the average increase worked out. This gave rise to what are known as "age correction factors," which are reasonably accurate, particularly when applied to initial test records, though individual cases may show wide discrepancies. This accuracy will, of course, depend largely on the maintenance of similar conditions of feeding, management, &c., and further corrections will also be required, depending on the number of days under test, e.g., 273 or 365; and whether the animals are milked twice or three times a day. The Bureau of Dairy Industry of the United States of America, after an exhaustive study of over 4,000 District Herd Improvement Association records, published the following correction factors:—

2 years	.. 1·3	4 years	.. 1·06
2½ years	.. 1·2	4½ years	.. 1·04
3 years	.. 1·15	5 years	.. 1·02
3½ years	.. 1·10		

By the use of such age correction factors two known comparable quantities are now available, viz., the production of the dam and of her daughter, and, in view of the foregoing, it should be possible to calculate the potential production of the bull.

The Bull Index.

It became apparent that a comparison of the productivity of the daughters of a bull, with that of their dams, should indicate the productive ability transmitted to them by their sire. Further, since sire and dam each contribute half the characteristics of their progeny, it is to be expected that the level of inheritance would fall approximately midway between both parents. This was actually proved to be the case as far back as 1913 by a Swedish investigator, Dr. Hansen; and further

investigation in America by numerous workers has proved that even when animals from high and low-yield strains are crossed this still holds.

This led to several investigators producing various systems of what is called "bull indexing," but owing to their complexity, and certain inaccuracies, most of them have failed to gain popular favour. The one which is considered the most satisfactory is that known as the Mount Hope index, which was evolved by Dr. Goodale in 1927, based on certain experiments done by Dr. Gowen. This system has since been presented in a modified form known as the "commercial" or "intermediate" index, which is the one now in general use.

Calculating a Bull Index.

To calculate under this system the index of any bull, the first step is the computation of the "mature" production of milk and butter fat of individual cows mated to him and of each daughter got by these matings. By the use of correction factors the "mature" equivalent is obtained for any age recorded, as indicated previously. When figures for several lactation periods are available each of these is corrected for age, and the average "mature" production figure taken for that animal. A comparison of these corrected records of mothers and daughters establishes what are known as "dam-daughter" pairs. It must be borne in mind that, to give the index its full value, one must include records of all daughters, and not simply those which qualify under a herd-recording scheme, as obviously an entirely erroneous figure would be arrived at if only daughters that qualified were selected.

Authorities differ as to the least number of dam-daughter pairs which are required to give an adequately accurate prediction of a bull's value. As with all statistical data, the greater the number available the less the margin of error, and reliance should not be placed on anything less than eight pairs. At the same time as few as four or five will at least give some indication of a sire's worth in a herd.

The next step is to calculate the average yield of these dams and the average of their daughters. The latter, as mentioned previously, tend to fall midway between sire and dam. From these figures the following are then calculated:—

(*a*) *Indices for Butterfat or Milk.*—

If the daughter's production is higher than that of the dam add to the average yield of the daughters the difference between the average yields of the dams and the daughters.

If the daughter's production is lower than that of the dam subtract from the average yield of the daughters the difference between the average yields of the dams and the daughters. (Alternatively these indices can also be arrived at by doubling the average yield of the daughters and subtracting that of the dams.)

(*b*) *Butterfat Percentage.*—

From the indices obtained multiply the butterfat figure by 100 and divide by the milk figure.

Examples of the Calculation of the Index.

Herd A.—In a certain herd the average yield of all the mates to a certain bull, corrected to mature production, was 319 lb. of butterfat and 8,398 lb. of milk; and of the daughters 455 lb. butterfat and 11,990 lb. milk.

The calculations are now made as follows.

Butterfat.—	lb.
Average production of daughters	455
Average production of dams	319
Difference	136
Milk.—	
Average production of daughters	11,990
Average production of dams	8,398
Difference	3,592

As the daughters' production is higher than that of the dams, one now adds the above figures for the difference to the average production of the daughters, the resulting figure giving the bull's index as follows:—

Bull's Index for Butterfat.—	lb.
Average production of daughters	455
Difference, as shown above	136
Total (Index)	591
Bull's Index for Milk.—	
Average production of daughters	11,990
Difference, as shown above	3,592
Total = Index	15,582

Butterfat Percentage for Bull.—

$$\frac{\text{Bull's index for butterfat} \times 100}{\text{Bull's index for milk}} = \frac{591 \times 100}{15{,}582} = 3{\cdot}79 \text{ per cent.}$$

Herd B.—As an example of the value of the index to detect a bull which is actually worthless, but which on type and pedigree might have been expected to be an excellent sire, the following figures are given:—

Dam's average butterfat production 371 lb., milk 9,569, test 3·88.

Daughter's average butterfat production 330 lb., milk 8,740, test 3·78.

This bull's index, worked out as above, is 289 for butterfat and 7,901 for milk, with a test of 3·65, all of which figures are considerably below those for the cows with which he was mated.

Conclusions to be Drawn from Examples Given.

In the case of Herd A practical observations had given some indication of the bull's worth as a sire, but on working out the index concrete

evidence is at once available as to his great value in raising both milk and butterfat production. It may also be added that this bull would never win a prize on show ring type.

In the case of Herd B the figures demonstrate that a sire with a poor index depresses the production of his daughters below that of their dams. Such a bull is an absolute menace to the herd.

It must be remembered, however, that the results can vary between wide limits. The sire may reduce the milk yield but raise the butterfat production and test, or lower butterfat production and test but raise milk yield; at other times there may be little material difference either up or down. If, however, the production level of the herd is high and the daughters of the bull maintain it at that high level, he is still an excellent sire. It is in such a case as this, i.e., an already high-producing herd, that the index is particularly valuable—in fact, almost indispensable—to ensure that there will be no retrogression by the use of a low-index bull.

Under different conditions of management and feeding the production level of cows will vary, and this may affect, to some extent, the sire's index; but a good sire always remains a good sire, and the greater the number of records taken the more reliable will be the index. It becomes apparent that a sire with a moderately good index will show up well in a poor herd but poorly in a high-producing one.

Summary.

There is a pressing need, particularly in this country, for a steady improvement in our livestock production. Type and pedigree, *per se*, as a measure of value, have reached the limit of their usefulness. Production recording in cows is an essential, but something further is required to ensure that sires used will tend to improve rather than retard herd averages. Progress in breeding must depend on the use of sires which have been progeny tested, i.e., proved sires, and the bull index is one useful instrument whereby the potential value of sires can be elucidated. Cases are on record where a bull has received awards in the show ring and on test it has been proved that his daughters' production was very much lower than that of their dams.

If our dairying industry hopes to hold its own steps must be taken to eliminate the poor sire, and the bull indexing system gives the breeder considerable assistance in this direction. It must be borne in mind, however, that bull indexing is not the complete answer to all breeding problems, but must be used in conjunction with selection for type and pedigree, while careful attention must also be given to nutrition and the control of disease.

STARTING WITH PURE BRED STOCK.

Buying pigs or calves too young and when not properly weaned is the wrong way to start with pure-bred stock. No breeder can judge a little pig with any degree of certainty. Pigs or calves which are taken straight off the dam are generally half starved by the time they get to their new home, and are then likely to overeat feed to which they are not accustomed, and that is how trouble starts.

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture, and Chief Inspector of the Banana Industry Protection Board.

[*Continued from page* 241, *March*, 1938.]

DESUCKERING.

SOME years ago, when only the richest of land was used for banana-growing, and beetle-borer and leaf spot were factors causing very little concern, the practice of desuckering was not considered by growers to be so necessary, but now, when poorer land is being used, desuckering is almost as important as cultivation. The object in desuckering is to produce better-class fruit. In fact, it is pruning the banana, just as citrus and deciduous orchards are pruned with a similar aim in view. Desuckering is done with a desuckering tool as illustrated in Plate 112. Small suckers, commonly known as peepers, are easily removed by

Plate 112.

Desuckering Tool.—Note length of blade, which is hollowed out and sharpened on both edges. This tool destroys the plant, by completely removing the heart, but leaves the rooting system of the stool intact.

forcing this tool perpendicularly through them and giving one complete turn. This action removes the heart of the sucker in the shape of a cone, thus stopping its growth without interfering with the rooting system of the stool in any way. Desuckering with a mattock or a crowbar results in more or less damage to the roots and the weakening of the remaining plants, and should therefore be avoided. Where the

plants to be removed are more than 6 inches above the ground surface it is preferable to cut them off with a knife at ground level and then bore the centres out with the desuckering tool similarly to the operation performed upon the younger plants. A few handfuls of soil placed in and over the inverted cone-shaped cavity of each plant treated, immediately after the operation, will stop an excess waste of sap through the new wound, and to a certain degree will restrict the invasion of beetle-borer, which might be attracted by the freshly-cut plant material.

Plate 113.

Desuckered on the two bunches per stool per annum principle. Note original parent butt in the centre, then second, and finally third generation.

Many opinions are held as to the correct time to desucker. Although circumstances govern opinion to some extent, it is undoubtedly true that the sooner the unwanted plants are destroyed after showing through the ground the better. By this it is not meant that desuckering should be made a monthly operation, for the running of a banana plantation successfully embodies too much work to permit of too great a departure from recognised practical methods. It is necessary, however, that the destruction of surplus suckers be attended to as often as possible and at least once in every three months, the first operation commencing when the young plantation is from six to eight months old. This will obviate the necessity of destroying big and vigorous plants, the establishing of which has drawn much nutriment and plant vigour from the stool in the course of its growth.

Further, by removing the young surplus plants frequently, the correct plants for the ratoon crop are easily discernible to the grower who understands the seasonal growing conditions within his own particular district. By studying these conditions and desuckering carefully, it is possible for a grower to regulate crop production and marketing. For instance, weather conditions remaining favourable, a young sucker, having produced in all fifteen or sixteen leaves by the time the parent plant throws its bunch, will throw its own bunch twelve months later. So that to avoid the small November fruit or to harvest fruit of excellent quality during March, April, and May becomes a matter of studying a district's normal growing conditions and desuckering accordingly. The following figures, taken from some records kept on the bunching of a North Coast plantation, go to show the time necessary for a bunch to reach maturity under normal conditions:—

Number of Bunch.	Date Flowered.	Date Cut.	Number of Days to Mature (Approximate).
1	1–15 Dec., 1935	29 Mar., 1936	106
2	16–31 Dec., 1935	29 Mar., 1936	90
3	1–15 Jan., 1936	20 Apr., 1936	97
4	16–31 Jan., 1936	1 June, 1936	123
5	1–15 Feb., 1936	18 June, 1936	125
6	16–29 Feb., 1936	29 Aug., 1936	183
7	1–15 Mar., 1936	29 Aug., 1936	168
8	16–31 Mar., 1936	6 Oct., 1936	190
9	1–15 Apr., 1936	28 Oct., 1936	197
10	16–30 Apr., 1936	14 Oct., 1936	168
11	1–15 May, 1936	20 Nov., 1936	190
12	16–31 May, 1936	17 Nov., 1936	171
13	1–15 June, 1936	4 Dec., 1936	173
14	16–30 June, 1936	4 Dec., 1936	158
15	1–15 July, 1936	14 Dec., 1936	153
16	16–31 Aug., 1936	15 Jan., 1937	138
17	1–15 Sep., 1936	15 Jan., 1937	123
18	16–30 Sep., 1936	29 Jan., 1937	122
19	1–15 Oct., 1936	4 Jan., 1937	81
20	16–31 Oct., 1936	27 Jan., 1937	89
21	1-15 Nov., 1936	3 Mar., 1937	109
22	16–30 Nov., 1936	3 Mar., 1937	94

With regard to the best suckers to retain, only those growing from well down on the butt of the parent plant should be considered. On hillside country these should be selected on the top side of the stool, thereby guaranteeing a deeper and better rooting system. The further away the young plant shows through the ground from the parent plant the better. Cramping within the stool is most undesirable, tending as it does to restrict root growth and forcing the bases of the plants up on to the surface of the soil.

The quality of the land, rainfall, and cultivation are factors that regulate the number of plants to be left. Some growers advocate the one-bunch-one-sucker system. This system necessitates the saving of a deep, vigorous sucker appearing at the correct time on the top side of the parent plant. Other growers prefer to produce two bunches with two followers from each stool each year. The latter system is generally in use throughout most of the banana districts in Queensland. It necessitates allowing two suitable suckers to grow from the original

parent plant more or less simultaneously (see Plate 114). For preference on hillside land these should appear on the top side of the original parent and slightly to the side. Future generations should be formed by allowing suitable single suckers to grow on the top side of each parent. On flat land the suckers left should be spaced round the

Plate 114.

Desuckered to produce two bunches per stool per annum. Note growth of plants. Remains of original plant show how each generation is allowed to follow.

parents and as far apart as possible. Each generation of plants should be formed from the generation immediately before it, i.e., two generations should not be produced from the one parent. By adhering to this policy faster growth will result, and under natural conditions a greater amount of good quality fruit will be harvested. Apart from the fact that spring and summer are the recognised seasons of the year when plant growth is at its peak, it will be noted that the greatest sucker growth will be recorded immediately after the cutting of the matured bunch from the parent plant. This fact should always be considered when selecting the plants which are to provide the future bunches in the plantation, for the growth of the sucker during the first and second quarters might represent only 25 per cent. of the growth during the next six months.

FERTILIZING.

Just as in recent years it has become more necessary to pay attention to desuckering, so has the fertilizing of bananas become more necessary. When only the best of virgin soils were used general fertilizing was often unnecessary, but on much of the lower-grade country now being utilised it becomes an important factor in successful banana growing. Big dressings of fertilizer give far better results than small dressings, but in considering this matter growers must be guided by the

fact that there exists an economic limit. The application of large quantities of fertilizers when prices for fruit are low or likely to be so is not sound farming; but if the market is good and profitable, then extensive fertilizing undoubtedly pays. Over a number of years growers have used artificial fertilizers more or less experimentally, and many are now using successfully a 4-12-12 formula made up as under:—

Sulphate of ammonia	420 lb.
Bone dust	560 lb.
Superphosphate	700 lb.
Muriate of potash	560 lb.

i.e., 2,240 lb., or *pro rata* for smaller quantities.

On land that needs fertilizing, work should be commenced right at the time of planting. *The actual quantities applied are naturally governed by the quality of the land.* It also should be remembered that the bunch is apparently not influenced by the application of fertilizer after the plant is eight to nine months old. In the poorer soils 1 lb. of fertilizer mixed in the hole with some surface soil just prior to planting gives the young plants an excellent start. This is followed by a second dressing of from 1 lb. to 1½ lb. three to four months later. Normally this application is broadcast round the top side of the plant and chipped in. The third application is made in a way similar to the second, before the beginning of spring, and is slightly heavier than the previous applications, 1½ lb. to 2 lb. being considered a fair dressing, thus making a total application of 4 lb. to 4½ lb. for the first twelve months. Thereafter the plants are fertilized three times a year—during January, April, and August—applying slightly less than 2 lb. per stool per application, which is roughly 1 ton per acre per year.

Departmental experiments are not yet far enough advanced to offer alternative formulas, but it is worthy of mention that the records of recent trials in other parts stress the importance of the application of nitrogen for the production of bigger crops. In Jamaica 2 oz. of nitrate of soda per young plant or sucker per month has shown big increases in the weight of fruit produced per acre. Whether such a method of fertilizing would be successful in Queensland has yet to be determined. In soils lacking in nitrogen good results would probably follow, but the possibility that fruit grown with the aid of nitrogen only would be of poor carrying quality and lacking in flavour naturally suggests caution at the outset.

A good banana soil is one containing an abundance of humus and nitrogen. Both, particularly the nitrogen, are prone to leach out rapidly in districts where the rainfall is frequent and heavy. Although the banana trash and spent stems build up the diminishing humus content to some extent, green cropping with such crops as Poona pea or field peas is of great advantage. To ensure a quick and vigorous growth of these legumes, top-dressing with either sulphate of ammonia or nitrate of soda at the rate of 1½ cwt. per acre is recommended. The seed should be sown in shallow drills running horizontally through the plantation. The best time to sow is during April, and the ensuing growth should be chipped in towards the end of July. A quantity of skinless barley seeds mixed in with these seeds is often advantageous.

[TO BE CONTINUED.]

Queensland Weeds.

ANODA CRISTARA: A RECENT INTRODUCTION OF THE MALLOW FAMILY.

C. T. WHITE, Government Botanist.

Description.—Annual herb, 1 foot or more high; stems clothed with long, scattered hairs; leaves lobed, 1½-2 inches long, and nearly as broad, on a slender leaf-stalk (pedicel) of 1-1½ inches. Flowers pale blue, borne in the leaf axils on slender stalks (pedicels); seed capsule composed of about fifteen carpels radiating from a common centre; the whole about 1 inch across, and subtended and partly enclosed by the five-lobed calyx. Each carpel pointed at the end and enclosing a single dull-brown seed 2 inches long and nearly as broad, flattened on the sides and rounded on the back.

Distribution.—A native of Mexico and Central America. We have no record as to when it was introduced into Australia. It is prevalent in some lucerne fields near Ipswich, and is supposed to have been introduced with imported chaff.

Common Name.—I know of no local name commonly given to this weed. The generic name is short enough for general usage.

Botanical Name.—*Anoda,* from "a," without, and "nodos," a node, alluding to the flower stalk, which lacks the joint usual in the allied genus, Sida; *cristatus,* Latin, meaning crested, but I am not sure of the application.

Properties.—Not known to possess any harmful properties; cut along with the standing crop it should not be unpalatable to stock, though rather fibrous.

Eradication.—So far as I know this weed is confined to the neighbourhood of Ipswich, where it is abundant in some of the lucerne areas and is said to almost beat lucerne in its growth. It is almost sure to spread generally over the Lockyer and Fassifern districts, and gradually extend to other areas. As it is an annual, every attempt should be made to prevent seed production by hand pulling or hoe cutting before ripe seeds have been formed.

Botanical Reference.—*Anoda cristata* Schlecht, in Linnæa XI. (1837) 210.

Acknowledgment.—I am indebted to the Director, Royal Botanic Gardens, Kew (England) for the determination of this plant.

DESCRIPTION OF PLATE 115.

Anoda cristata.

A. Twig, bearing flowers and seeds (natural size).
B. Seed-head viewed from front × 2.
C. Seed-head viewed from back × 2.
D. Seed × 2.

Plate 115.

Concerning the Brigalow.

E. HIRSCHFELD, M.D., and R. S. HIRSCHFELD.

The subjoined article has been submitted to the Minister or Agriculture and Stock, Hon. Frank W. Bulcock, who has authorised its publication as a further contribution to a discussion on a subject of considerable importance to Queensland farmers and graziers.—Editor.

NEXT to the prickly-pear, the brigalow has been the greatest obstruction to settlement in Southern Queensland. The prickly-pear is now a menace of the past—the brigalow still continues to hamper the efforts of the settlers.

Plate 116.
Bybera Homestead.

Up to about thirty years ago brigalow and belah scrub was left severely alone. When some courageous pioneers realised how valuable this land was after the trees had been cleared off, others followed. Now an increasing wave of settlement is starting in that direction.

There is a big area of brigalow and belah country in Queensland. It probably amounts to between 15,000,000 and 20,000,000 acres. The time will surely come when this vast area will prove as great a possession to our State as the plains of the Darling Downs—great in settling people on the land, great, also, in bringing forth increased wealth in sheep, cattle, and dairy products.

But the brigalow will have first to be dealt with.

Since 1929 we have ringbarked 13,000 acres on Bybera. A considerable proportion of this area has been brigalow and belah country. Bybera is 25 miles due north from Yelarbon, where the brigalow and belah belt from Northern New South Wales enters Queensland between Inglewood and Goondiwindi.

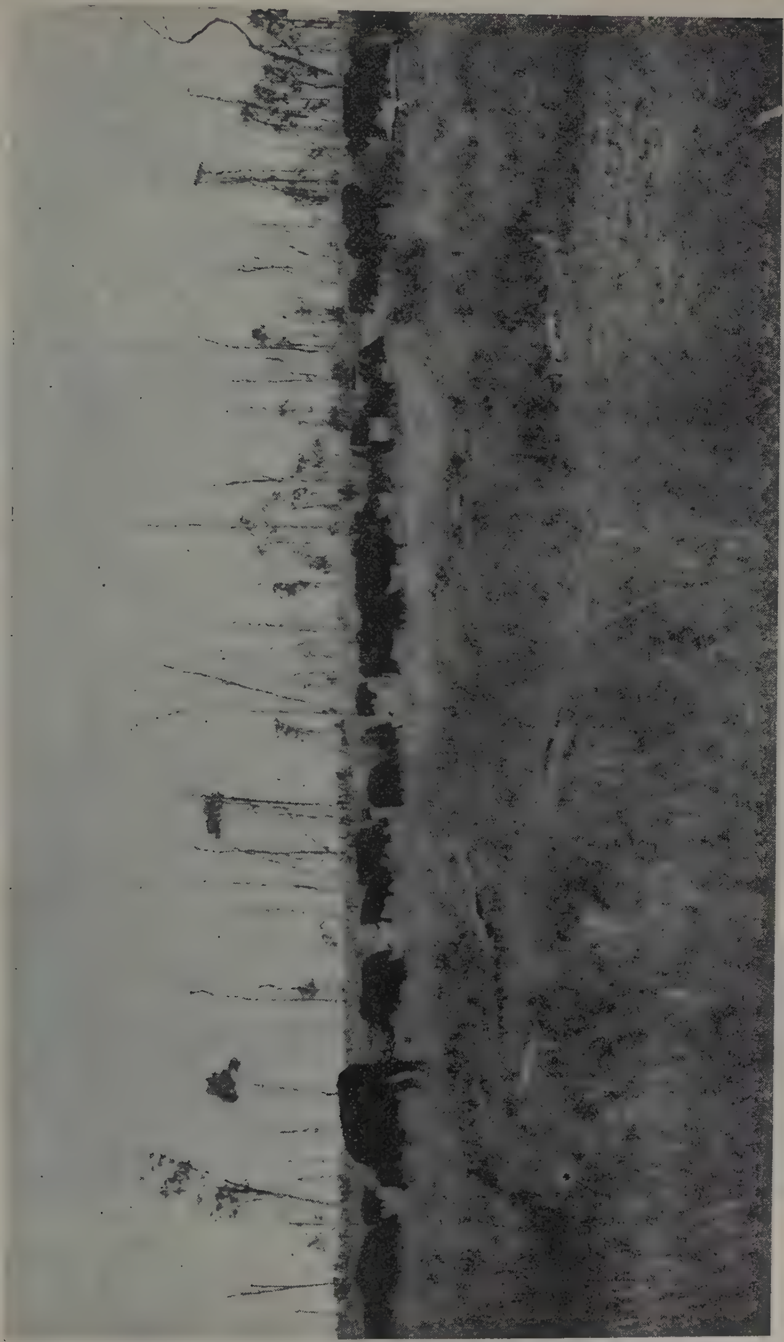

Plate 117.

Aberdeen Angus Cattle Thrive on Bybera Pastures.—This country now carrying heavy swards of nutritious grasses, was formerly covered with dense brigalow and belah scrub.

We now place on record our observations and experiments and the recommendations based on our experience.

Ringbarking, Burning, Regrassing.

The recognised way of tackling brigalow and belah scrub is by ringbarking. The belah dies readily, but is followed by numerous seedlings which are fairly easy to deal with. The brigalow is slow in dying. It takes three or four years before the scrub is ready for the burn. As soon as the trees begin to wilt native grasses commence to shoot up from the ground that had previously been quite bare. Foremost amongst these grasses are the brigalow grass, windmill, star, button, blue, wallaby, and other chloris grasses—nearly all of them most valuable and eagerly sought after by the stock. They are at their best within the first two years after the ringbarking; then they become rank, and are spoken of as sour. We are satisfied that this is not due to any lack of virtue in the grasses or the soil. The fact is that the vegetation gets ahead of the stock which, notwithstanding the ample feed, prefer more open country. The fallen timber and the numerous melon holes do not make the scrub a desirable feeding ground. Hence, the grass is getting coarse. This view is confirmed by the analyses we had made by the Department of Agriculture.

Plate 118.

Storerooms and Workshop on Bybera.

After three or four years the scrub is ready and safe for the burn. If all the conditions are favourable the fire will leave an open plain, and in a few cases the fortunate holder may have no further trouble with his timber. The fiercer the fire the more complete the destruction of the trees, but such a result is the exception rather than the rule.

There are some serious drawbacks to this procedure. The loss of shade trees is soon made good; for wilga springs up rapidly after a fire, grows quickly, and this small, bushy tree gives better shelter against the sun than the tall, branchless brigalow. But the fire that makes a clean sweep of the living things above the ground also destroys the living things within the soil which may be necessary to plant life, like earthworms, insects, bacteria. The surface layers are sterilised—to what depth depends upon the heat and duration of the fire. Where a log has been burning or smouldering for weeks we have seen the scar remain on the ground for many years. *The most lasting injury the country suffers is through the loss of humus, which is all the more serious, since the trees are gone that could replace the mould.*

Plate 119.

Keeping Cool.—A dense growth of grass encircles this rain-filled melonhole.

The land must be artificially regrassed after a hot fire. Not to do so means the loss of pastures for several seasons and giving all sorts of rubbish a chance to get a root hold. Seeds that are carried by air will be the first to germinate. Windmill and star grasses, with their seed-heads on a small stem, sail along in the wind and settle down as soon as the wind drops. He who trusts to chance and good luck has to wait about three years before the native grasses are once more established. The loose layer of ashes is an admirable seed-bed, provided rain falls within a reasonable time after the fire, otherwise the ashes settle down and harden. No other grass can approach the Rhodes for artificial regrassing. It sends out runners which quickly cover the ground and take fresh root at the nodes. The stock—both cattle and sheep—like the Rhodes, and punish it more than the native grasses. Yet a warning is necessary against sowing Rhodes too densely to the exclusion of the native grasses. The country we live in is very cold in winter, and severe, continuous frosts are the rule. The frost kills the Rhodes grass. Hence, at the beginning of the winter, the grazier may find himself suddenly with the bulk of his pastures turned almost useless.

Our native grasses, on the other hand, stand the winter well. There are always a few green shoots in the brigalow grass clumps, no matter how cold the weather may be.

We have experimented with a large number of other grasses and legumes, and planted them in the ashes—Mitchell, Flinders, prairie, Wimmera rye, Toowoomba canary, lucerne, different trefoils, and creeping lucerne, which latter was placed at our disposal by the Waite Institute. We cannot go in this report into a detailed description of the results of our experiments.

Plate 120.
Looking across well-grassed paddocks, covered formerly with brigalow and belah.

The Brigalow.

The brigalow is an acacia closely allied to the wattle. It is often spoken of as the brigalow-wattle. Other members of the same family are the mulga, the yarran, and the myall. Unlike these valuable fodder trees, the brigalow is not attractive to stock. The leaves are shaped like a crescent, up to 6 or 7 inches in length, and leathery—too tough to be digested easily. It is said that sheep, when turned on to very young suckers, will tackle them, but we have had no personal experience of it. The tree in the scrub grows up to 30 and 40 feet and even higher, runs straight up without branches, and is topped by a crown of small branches bearing these leaves. They are firmly fixed to the stem, and remain there after they are dead. It is an uncanny sight to enter a brigalow scrub that has been poisoned and died quickly. The plumes of leaves turned a whitish grey give the trees a ghost-like appearance.

When the trees grow in the open they like to form clumps and grow bushy. After the destruction of the scrub timber these copses furnish valuable shade which the tall scrub tree, with its meagre crown, fails to do. Besides, they are good to look at. It is a sound practice to encourage the formation of these clumps.

The timber is far from useless. It is heavy, hard on the saw, and difficult to work. With a piece of broken glass and a lot of patience we were able to give a good surface to some walking sticks we had

fashioned. The aboriginals who had more leisure, more labour, and a good deal more skill were using brigalow for making boomerangs, nulla nullas, spears, and other fighting implements. Hence the timber is called brigalow spear wood. It is elastic and said to make particularly useful fishing-rods. Of course it would be a serious matter to destroy wholesale a valuable timber, but the small size of the trunk restricts its use except for small jobs, like handles of stockwhips, serviette rings, and other fancy goods.

Plate 121.

ON THE EDGE OF THE CLEARING.—These picturesque apple trees give cool and generous shade on a summer day.

There is, however, no need to waste much sympathy on the destruction of the brigalow. Owing to its tendency to sucker, it grows again with such rapidity that many men who have cleared this sort of country with apparent success will have to continue to fight the timber for the rest of their lives. In the Callide Valley the brigalow has been rung, cleared, burned, and grassed. Now in quite a number of places the brigalow has come back, and the people have little hope

of dealing with it. At Tara men had started dairying on their selections, but the brigalow has got the better of them and driven some of them out.

The Scrub.

The brigalow scrub is made up of a dense mass of trees, both standing and fallen. Associated with the brigalow may be the belah, the wilga, and the tea-tree. Neither the belah nor the wilga suckers, but they bear a great quantity of seeds. They propagate by seedlings, which are easier to deal with than the suckers.

Plate 122.

A POOL OF REFLECTIONS.—A large melonhole forms a natural reservoir in the brigalow country.

The danger of the tea-tree has not been sufficiently realised. It is a very fertile seed-bearer; it also suckers, mostly from the stem, not like the brigalow from the root. Being rich in oil, it annoys the men working amongst them. It gives rise to itchiness of the skin and headaches. Generally it is a shrub, but once its bigger neighbour has died it commences to flourish and expand into a bushy tree. Wherever a wound has been made in the trunk a sucker will come out and so make the tree more bushy. It is really quite a handsome tree when fully grown and flowering. The timber is quite useless. To get rid of the tea-tree is no small job. A fierce fire will kill it, but unless the fire is very hot it will sucker worse than ever. The only way in which we were able to deal with it was by cutting it down prior to burning off.

The dense withered foliage of the tree, full of oil, forms a track for the fire, eating into the brigalow. Where isolated tea-trees remain we found it best to ringbark them close to the ground and poison them.

The brigalow, the tea-tree, the belah, and the wilga are the masters of the scrub; no grass grows where they flourish. It is estimated that 75 acres of scrub will feed a bullock; we doubt whether a beast could make a living even on that area, even if it wanted to. With its fallen timber, its melonholes, and the death-adders below the rotting *debris*, it is a truly forbidding country, and quite useless until man starts to improve it.

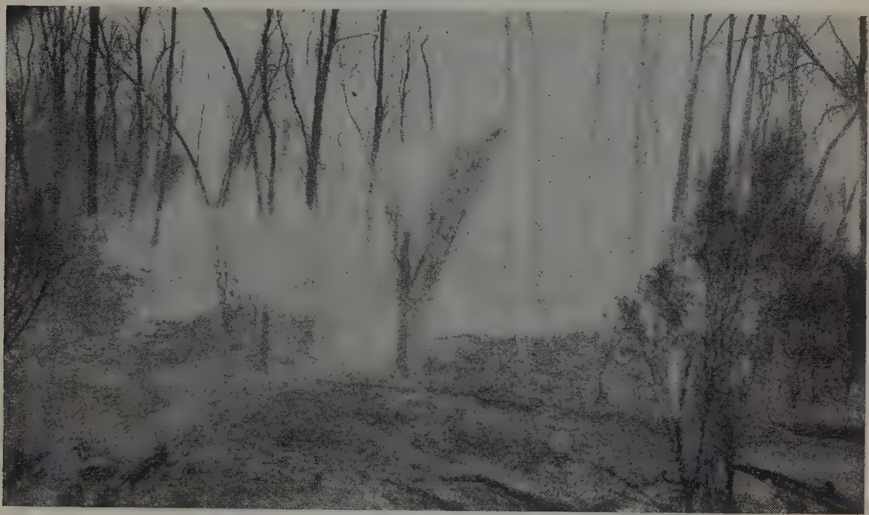

Plate 123.

Burning Off.—A fire sweeping through the ringbarked scrub, making a clean burn. Fallen brigalow and belah logs usually burn out to a clean white ash.

How the Brigalow Conquers the Country.

Since 1929 the brigalow has flowered but once on Bybera. Being such a scanty seeder, it cannot go forth into the world and conquer it by scattering a numerous progeny. Propagating itself by illegitimate means, by asexual reproduction—that's how the brigalow succeeds in beating other plants and trees. It suckers. The box and the tea-tree sucker from the trunk, the brigalow from the roots. To find out how this tree does it we have obviously to search the roots for their secret.

There seemed to be no difficulty in studying the root system of the brigalow. Hundreds of fallen trees cover the surface, exposing the roots and leaving a gaping hole in the ground. The trees always grow on the fringe of the melonholes, never in them. Hence the soil is washed away from the roots, loosening their hold. A heavy rainstorm or wind upends the tree and sends it crashing down across the melonhole.

The first thing that strikes you is that there is hardly any taproot; the roots radiate from the base of the trunk, most of them of considerable size, few of them lengthy. The same is apparent when digging up a tree that has not fallen. The distinguishing feature is *the shallowness*

of the roots; they keep close to the surface. We shall see the importance of this point later. Even where a root dipped into the earth to a depth of 10 to 12 inches, it turned upwards again and came close to the surface. The root prefers the sun to the earth.

Plate 124.

UNDER THE BRIGALOWS.—Clumps of brigalow like this copse are reserved for shade on Bybera, giving a park-like appearance to the country when cleared and grassed.

Not obtaining any further information from the fully-grown trees, we turned our attention to young trees and suckers. Digging up a young tree about 3 feet in height, we found practically no taproot but a strong shoot half as thick as the trunk was running at a right angle for a distance of 20 to 25 feet. It did not go down into the ground but kept within an inch or two from the surface. At regular intervals other and smaller trees sprang from this runner. Here we had a typical specimen of the brigalow sucker. Like the old tree, no taproot but the root closely hugging the surface and readily exposed to hurt by the stock grazing over it. As the outer layer is injured the vigorous life within the runner is stimulated into fresh growth. It is more likely to happen with young trees than with old ones where life is less vigorous and where the root is bigger and protected by thicker bark. This explains a fact recorded by many experienced settlers that the brigalow spreads with increased settlement.

Fire is the chief cause of the spread of the brigalow. After the tree is ringbarked the trunk and leaves die, while it takes at least three years before all the life has gone out of the roots. Suppose a fire starts in the scrub accidentally or intentionally, within that length of time what will happen is this: the bark of the roots gets burnt first; the sap pent up in the roots protects them to a certain extent, just as a living tree resists the fire. While the tree itself is dead, a mass of suckers starting out in all directions from the still-living roots carry on business as usual. Hence the warning given to every man who starts ringbarking his scrub not to burn too early. But three or four years is a long time to wait; dry spells are sure to happen within that time;

Plate 125.

Brigalow Country in its Natural State.—Virgin scrub soon to fall to axe and firestick, and giving place to a hock-deep cover of rich pastures.

bushfires are hard to avoid, and often do a lot of damage before they are put out. Fire by lightning on Bybera gave us about 20 acres of suckers, and we were grateful for the lucky escape. No one who has not seen it can have a conception how dense the suckers can be. The experience of one settler will illustrate it. A farmer from the Rosewood

scrub, together with his sons, had taken up brigalow and belah country near Miles. They set to with a will and followed what they were accustomed to in the Rosewood scrub. They cleared 50 acres by felling the trees, not ringbarking them. Then they stacked the timber and set fire to it after three months. Of course, a great mass of suckers came up and made the country useless. The father, describing his experience, remarked: "The suckers were that thick a dog could not bark in them."

How are we to deal economically with country that has suckered? The problem is almost similar to that of dealing with the prickly-pear in the pre-cactoblastus days. We have been experimenting since August last as time permitted.

We shall report as soon as results are finalised.

Plate 126.
Young Aberdeen Angus cattle sheltering from the noonday sun in a brigalow reservation on Bybera.

Poisoning of the Brigalow.

To prevent suckering the Prickly-pear Commission has strongly advocated poisoning the brigalow with pentoxide of arsenic after the tree has been ringbarked. We have done so on Bybera over an area of 370 acres with most satisfactory results. We had a 99 per cent. kill; it is now burnt off and regrassed.

The great advantage of poisoning is that tree and roots die quickly. Hence the risks of suckering through an accidental bushfire are materially lessened compared with country where you have to wait three or four years before you can burn. There is no doubt that box should under all circumstances be poisoned. Mr. W. Purcell, of the Prickly-pear Commission, has rendered a notable service to Queensland by urging the pentoxide of arsenic in season and out of season. The disadvantage is the increased cost. The initial cost is greater and may run up to a big sum where a large area is being handled. Every man will have to weigh for himself the increased cost against the advantage he gains. The department has assisted the settler by selling the arsenic at or under cost price and paying railway freight. The man who wishes to do dairying and cultivating and requires to have his holding cleared quickly and safely must use pentoxide in addition to ringing. The same applies to the selector who has only a small belt of brigalow and belah on his holding. In such a case, the increased cost would be small and the advantage agained considerable.

Adding a dye to the solution of the poison—as recommended by the Prickly-pear Commission—is a great improvement. The sap quickly takes the dye, enabling you to see at a glance which trees have been done and which have escaped. We ascribe to the dye the excellent results we ourselves have obtained.

The handling of the poison is, of course, a grave matter, and should not be undertaken without due warning. There are so many ways by which arsenic can gain access to the body. Only men should be employed; men, naturally, are more careful than boys. In addition, the skin of a youth is more sensitive and less protected; hence absorption of arsenic may take place even through the unbroken skin. It is not easy to keep one's skin unbroken when attacking trees with an axe. All men handling arsenic should be clearly warned regarding the risks and dangers connected with it. This applies not only to the poisoning of the trees. Arsenic is used on the farm and on the sheep station for all sorts of purposes. Arsenical poisoning of man is more widespread in the bush than is being realised. Death is rare, but accidents are frequent. Chronic after-effects of arsenical poisoning are often ascribed to other causes. Such has been my experience in my practice.

All that is required to safeguard a man is that he should be warned in plain language. That is the least we owe him.

*   *   *   *

Queensland owns a great estate in its brigalow and belah scrubs. The proper handling of this country will bring many millions of acres into production. It will also provide remunerative employment for a great number of men in clearing it. Owing to its peculiar colloidal subsoil the ground holds moisture for an exceptionally long time. Once the clearing is accomplished the harvest is in sight. We possess no other country in Queensland that can compare, in my opinion, with brigalow and belah country in its drought-resisting capacity.

The Dairy Industry in Britain and Denmark.

L. F. ANDERSEN, Instructor in Dairying.

Subjoined is an interesting pen and camera record of a recent tour by Mr. Andersen with a party of farmers organised by the Jersey Cattle Society of New Zealand. He visited his homeland, Denmark, after an absence of thirty-seven years, and was greatly impressed with the progress of the dairy industry there, as a result of systematic herd testing and recording.

Plate 127.

OUTWARD BOUND ON MORETON BAY.—The voyager's last view of distant Brisbane.

IN ENGLAND.

DURING our tour of England we inspected many herds of many breeds, and the people we visited were always most anxious to show us their stock and farms, as well as places of historical interest. The wonderful hospitality with which we were received wherever we went is a cherished and abiding memory.

The first dairy herd inspected was a Jersey herd of about 250 cows of all ages. All animals had been tested for T.B., and forty cows had been awarded merit certificates with the English Jersey Cattle Society.

On another farm excellent herds of three breeds—Red Polls, Jersey, and Dexters—were seen. The Dexter cows were, like the others, of splendid type, and yields of over 5 gallons are recorded daily, the average fat per cent. being around 3·8.

Another good Jersey herd, T.B.-free, was inspected at Guildford, and from which certified milk is retailed at 6d. a pint.

One of the best Jersey herds inspected in England had produced many winners in milking trials from time to time, including the Mond Shield at the London Dairy Show, 1936. This herd has been tested consistently, and fourteen of the cows produced an average of 12,272 lb. milk, while some cows yielded more than 8 gallons daily.

Plate 128.
Belted Galloways at the 1937 Royal Show, Wolverhampton, England.

Excellent dairy Shorthorns, including many Royal Show prize-winners, were seen on another farm.

A day of special interest to the New Zealanders was spent with Lord Bledisloe, a former Governor-General of New Zealand, and who also had visited Queensland. Lord Bledisloe is a breeder of Red Polls, and the milk is converted into cheese in his own factory. Extensive pig

Plate 129.
Entrance to Ovaltine Model Dairy (England).

stables built on the Danish principle house a very large herd of about 600 Large Whites.

Plate 130.
ON AN ENGLISH DAIRY FARM.—Milk delivery by horse and motor vehicles.

The milk trade seems to engage the attention of all dairy farmers within the vicinity of big cities all over England. A milk marketing board is now operating, and every endeavour is being made to put the industry on a proper basis.

In order to encourage a pure milk supply from disease-free herds the British Government is contributing a large sum of money annually

Plate 131.
A Tractor-driven Hay Sweep in Use in England.

for a period of at least five years, and it is estimated that this year's contribution will be approximately £1,700,000. Under this scheme, a producer of accredited milk from a herd free from T.B. will receive a premium of 3¼d. a gallon.

For the production of pure milk with a low bacterial count great stress is laid on cleanliness, and on many farms special stalls are provided where each cow is subjected to a foot bath before entering the milking bails, while all utensils are placed in a steam chamber when not in use.

At the Royal Show.

A stay of several days was made at Birmingham, and from here, at the invitation of the Royal Agricultural Society of England, we visited the Royal Show held at Wolverhampton. After being used to Australian show grounds, with substantial permanent pavilions and accommodation for livestock, one was somewhat disappointed with the apparently makeshift conditions under which the Royal Show is held. When it was realised that the Royal Agricultural Show Society changes its venue every year, disappointment quickly changed to admiration for the remarkably efficient organisation behind it all.

Plate 132.
A Percheron Sire on a farm in England.

The stock exhibited at the Royal were, of course, of very high standard. In the cattle section, Dairy Shorthorns, Lincolnshire Red Shorthorns, and British Friesians were particularly impressive, while Jerseys and Guernseys were also well represented. Many other breeds, some of which are little known in Australia, were exhibited, including Dexters, Belted Galloways, Blue Albions, and Kerrys.

In the milk and butter classes many excellent results were recorded. In the milk yield classes one class only had been arranged for each breed, and points were allowed for the yield of milk, with additional points for milk containing more than 3 per cent. butter fat. Points for lactation were also allotted. The highest yield of milk recorded for 24 hours was 95 lb., produced by a British Friesian cow; this cow, however, failed to reach the required 3 per cent. fat standard. Excellent yields were also recorded in other breeds—such as 81 lb. from the

Plate 133.
A Percheron Mare on an English Farm.

Plate 134.
A Southdown Ram on its Native Heath.

winning Lincolnshire Red Shorthorn; Guernsey, 77¼ lb.; Ayrshire, 75½ lb.; Jersey, 70¾lb.; Dairy Shorthorn, 67¾ lb.; South Devon, 55½ lb.; Dexter, 52 lb.; Kerry, 49 lb.; and Blue Albion, 45¼ lb.

The butter trials were divided into two classes—light breeds, including Guernsey, Jersey, Kerry, and Dexter; and heavy breeds, which included all others. In these classes each cow's milk was separated and the cream made into butter, points being allowed for yield, lactation, service, and quality of butter. Low testers—i.e., cows from which more than 30 lb. milk is required to produce 1 lb. butter—were debarred from the winning awards. The highest producers in these classes were a Jersey cow, among the light breeds, with 3 lb. 8¾ oz. butter, and a Friesian cow, among the heavy breeds, with 3 lb. 2¾ oz. butter.

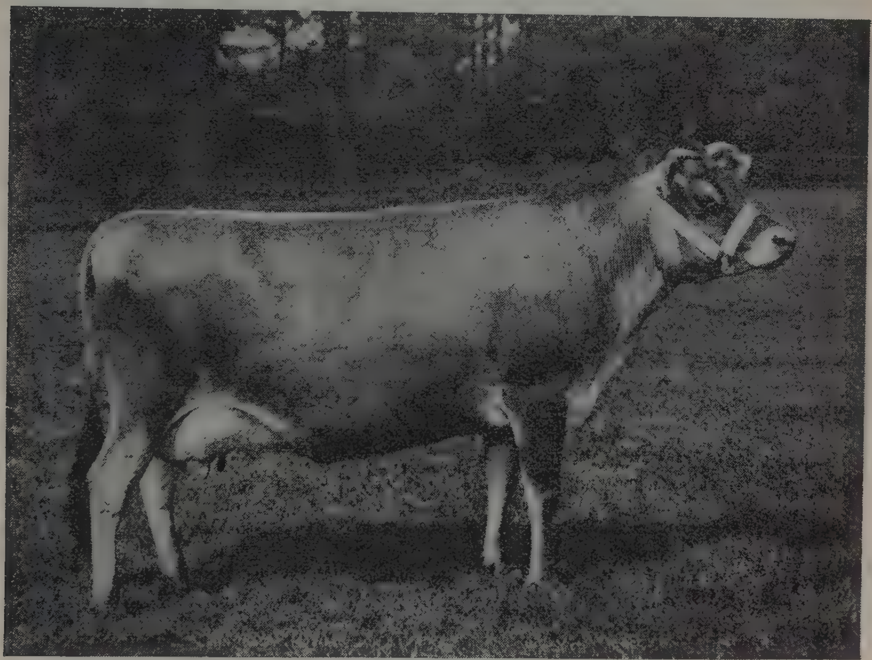

Plate 135.
Jersey Heifer, "Jack Sparrow Queen," owned by Lady Loder, Leonardslee, Horsham, Sussex (England).

This show class served a double purpose, as each cow's milk is separated and the cream used in dairymaids' butter-making contests, with small hand churns, on the ground.

To the average man a plot of 650 acres of celery may sound almost unbelievable, but such an area was inspected on one estate in the Fen country, East Anglia. One East Anglian farmer is the owner of a large tract of this country, about 12,000 acres. On this huge property celery is a very good paying crop, and although expenses are high, the net return is generally between £60 and £100 per acre. In addition to celery, 2,000 acres are down in wheat, 2,000 acres in potatoes, and 1,000 acres in sugar beet. The owner's wages sheet for 1935 amounted to £65,000.

In London a visit was made to Hay's Wharf, where practically all Empire as well as Continental butters are landed. Normally, 2,200 men work on this wharf, but in busy times the employees number 3,000.

Plate 136.
Jersey Bull, ''Kentwins Corona,'' owned by Lady Loder, Leonardslee, Horsham, Sussex (England).

In Tooley street, cold store butters were inspected from many countries—including Esthonia, Holland, Ireland, New Zealand, and Australia. Some Queensland butters were compared with samples from other countries, and I do not hesitate to say that Queensland butters lost nothing by the comparison.

IN DENMARK.

Haymaking was in full swing when the party arrived in Denmark, but as there is no Australian sun the progress is slow, and the farmer anxiously watches the sky in fear of having his hay spoiled. Cattle are seen tethered in the fields of clover; the Danish cow does not know the meaning of the word ''drought,'' but is simply a machine for producing milk and butter, and is fed accordingly. After a visit to Denmark one can understand why Danish butter always realises top price on the English market.

No home separation is practised in Denmark; the milk is delivered to the factory every morning. Pasteurisation is compulsory, the milk being heated to a temperature of 170 degrees and automatically reduced to about 100 degrees as it passes through the separators. Passing from the separators, the cream is again subjected to a pasteurisation of 192

Plate 137.
Typical Danish Farm Home.

degrees, after which it is placed in holding vats, where a certain amount of lactic starter is added to ensure the correct acidity desired for butter-making the following day.

The separated milk is returned to each farmer in proportion to his deliveries if desired; otherwise it may be used for skim milk, cheese, or casein. Before being returned the separated milk is treated with a lactic starter, which sets up an artificial souring, and, thus treated, it is

Plate 138.
Typical Danish Cow Stable.

a much safer food both for calves and pigs. There are in Denmark approximately 1,700 butter factories, the average output of which is 3½ tons of butter a week.

Butter is exported under strict Government supervision, and any factory may be required to submit a cask of butter to examination at a few hours' notice.

Any factory producing butter below the required standard is deprived of the use of the national brand until such time as the butter is again adjudged to be of first quality.

Plate 139.

A ONE-DOG POWER MILK CART.—Using domestic dogs for light street haulage is a common custom on the Continent. In the picture the dog is underneath the "chariot," harnessed to the axle.

Showing of Cattle.

The showing of cattle in Denmark is taken seriously, and the method of judging is different from that in Australia. Judging is not done by one judge, but in many instances the panel of judges may number twenty-four for cattle alone. There are always three judges working together on certain classes.

In a class for high-producing cows at one of the chief shows on the Island of Funen no entry is accepted unless a production of 660 lb. butter can be shown for one year. The winning animal in this class at last year's show had an average of 847 lb. butter for three consecutive years, the highest yield for one year being 948 lb. butter.

There are many regulations to which Australian dairy stock exhibitors would take strong objection; for instance, all bulls must be dehorned, and other requirements are equally mandatory.

Systematic Herd Recording.

It is in herd recording, however, that Danish farmers have shown what can be accomplished. The average yield of butter per cow has never been higher than it was last year, when all tested cows, including heifers, showed an average of 308 lb. butter-fat.

A most careful record is also compiled of food units used per cow, and it is noted that this increased production has been achieved without any extra concentrates, and it follows, therefore, that these excellent results, in the main, are due to careful breeding, testing, and culling.

Red Danish Cows.

Some very high average yields have been recorded; one owner with a small herd of six cows secured an average yield of 657 lb. fat, the highest yield being 855 lb. Another herd of eleven cows yielded 633 lb. fat per cow. Among the larger herds pride of place is held by Nasgaard Agricultural College, where the entire herd of 131 cows produced 534 lb. fat per cow, including all the heifers.

Plate 140.
A TYPICAL COW OF THE RED DANISH BREED.—Animals like this have built up the reputation of Denmark as a butter-producing country.

All the yields quoted are from the native breed—Red Danish—but several other breeds are represented among the high-producing herds. A Friesian herd of seventy-two cows is credited with an average production of 473 lb. fat, and a Jersey herd of 167 head showed a yield of 380 lb. fat per cow. The Red Danish cow, however, seems to be the most favoured, and no fewer than 432,000 were under test last year. That the Red Danish are the best producers is shown by the fact that of the highest individual yielding cows producing no less than 785 lb. fat per year, sixty-none cows are listed, sixty of which are Red Danish. The highest yield, however, was by a Jutland cow, 1,042 lb., which occupied the same position the previous year with a yield of 1,034 lb. fat.

Community Bull System.

As the number of cows in the average herd is very small, it is not economical for each farmer to own a bull, but by joining a bull association he may have the use of very high-producing sires. Some of these associations are in a position to buy the best bulls, and some may own ten to twelve bulls. It should not be imagined that bulls are cheap in Denmark. The farmer there says a good bull is always cheap and a poor animal always dear.

The co-operative bulls are stationed on the farms of members of the association, and the price of service is mutually arranged.

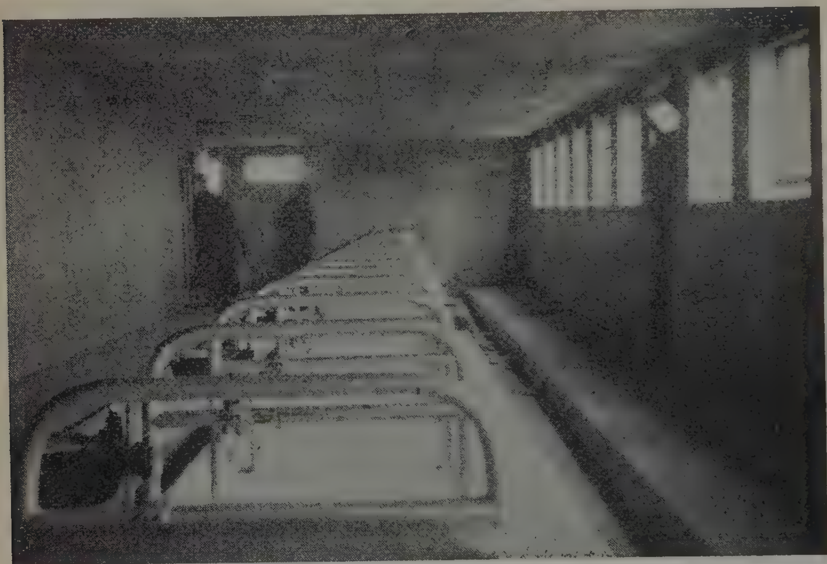

Plate 141.
MODERN MILKING SHED INTERIOR ON A DUTCH DAIRY FARM.—Cow accommodation like this is common on the newly-reclaimed areas in Holland.

Improvement in Yields.

In the early years of herd recording (1898-99) the average percentage of butterfat is given as 3·37 per cent. for 3,000 cows, with a yield of approximately 6,000 lb. milk per cow, whereas last year the average percentage is given as 3·9 per cent. for 432,000 cows, with a mean average yield of 8,260 lb. milk.

Thousands of owners, however, now boast an average herd test of well over 4 per cent. fat, and some have improved the test up towards 5 per cent. In one instance a herd of 130 cows owned by an agricultural college showed an average yield of 12,000 lb., with 4·41 per cent. butterfat, and many individual animals show an average of more than 5 per cent. butterfat.

Bull Indexing.

Equally important as herd recording is the system of indexing of bulls and progeny. The records of as many daughters as possible are examined and compared with the same number of dams. From the annual record of this work extending over the Island of Funen it is

noted that no fewer than 195 bulls are tabulated, and definite figures are quoted as to increase or decrease in yield of milk, the percentage of fat, and production of butter. For instance, the record of the bull Enggaard Rex (H.B. 2447) is given as follows:—

ENGGAARD REX.

—	No. of Cows.	Average Yield Milk.	Per Cent. Fat.	Average Yield Fat.
		Lb.		Lb.
		First Calf.		
Daughters	60	9,354	4·37	408
Dams	60	8,091	4·10	351
Increase	..	1,263	·27	77
		Second Calf.		
Daughters	70	9,928	4·44	440
Dams	70	9,160	4·17	382
Increase	..	768	·27	58
		Third or Later Lactation.		
Daughters	40	11,169	4·41	492
Dams	40	10,197	4·20	428
Increase	..	972	·21	64

It will thus be seen that the production of the daughters showed a definite improvement over that of their dams in all branches.

In comparison, the records of the bull Tjalfe Loby (H.B. 6789) are given as follow:—

TJALFE LOBY.

—	No. of Cows.	Average Yield Milk.	Per Cent. Fat.	Average Yield Fat.
		Lb.		Lb.
		First Calf.		
Daughters	22	6,963	4·03	280
Dams	22	8,652	4·08	353
Decrease	..	1,689	·05	73
		Second Calf.		
Daughters	22	8,566	4·02	344
Dams	22	9,994	4·19	418
Decrease	..	1,428	·17	74
		Third or Later Lactation.		
Daughters	7	8,987	4·10	368
Dams	7	10,027	4·32	433
Decrease	..	1,040	·22	65

Both these records are taken from the same volume. Although the dam and grand-dam of Tjalfe Loby had yields of 409 lb. and 525 lb. butter-fat, respectively, over a number of years, this bull was unable to get any daughters with a yield equal to that of their dams. No doubt

such bulls have but a short life in Denmark, but it is easily seen that much damage may be done in a herd with a sire of this character, and it goes to show with what breeders have to contend, particularly where little or no testing records are available.

T.B. Eradication.

The eradication of tuberculosis in cattle is now well in hand all over Denmark, and this also is having a great influence upon the average production. Whereas in 1895 the percentage of positive reactors to test was usually very high, to-day many districts are in the happy position of being able to show a clean bill. This work is encouraged by all co-operative butter factories, and is being carried out without any assistance from the Government.

Plate 142.
A Farm Home in Denmark.

At the Naesgaard Agricultural College, on the island of Falster, the oldest college in Denmark, great progress has been made in increasing the production of the herd of 140 cows of Red Danish breed, and during the past nine years the average production per cow has been raised by 88 lb. fat. During 1935 the entire herd, including heifers, produced an average of 534 lb. fat. No females have been brought into the herd for many years, but no money is spared to secure the best sires obtainable. Recently a young bull of the very best breeding was purchased for £300 cash, with a further £300 to be paid on condition that the bull and progeny secure certain prizes in shows.

Reduced Bacon Output.

Owing to restrictions in production of bacon, this industry is not in so flourishing a condition as it was a few years ago. However, the majority of farmers were not complaining much about the regulations, realising that it is probably the best policy to keep up prices. No doubt the restrictions interfered considerably with many large establishments, but as new markets are found these restrictions will gradually be lifted.

IN HOLLAND.

While in Holland the party inspected some of the land which had been reclaimed from the sea.

Before the reclaimed land is leased by the Government it is drained by canals and underground drains; it is then ploughed several times and treated with basic slag to sweeten the soil. A comfortable home and farm buildings are all ready for the farmer before he takes over. Rents are paid on an acreage basis, according to the value of the crops grown. This system is considered very satisfactory from the farmer's point of view.

Plate 143.

Stork's Nest on a Dutch Farm.—The stork is a popular bird in the Netherlands, where it is regarded as a harbinger of good fortune.

Excellent crops, such as wheat, barley, and oats, were seen in the reclaimed area, but grasses had not, apparently, done well during the first year or two.

The Zuider Zee, which covers approximately 70 by 25 miles, will in the course of about thirty years be entirely reclaimed, and so a new and fertile province will have been added to Holland.

Plate 144.

A DYKE ACROSS THE ZUIDER ZEE TOPPED WITH A MOTOR ROAD.—A large area of what was formerly the sea bed is now productive farming land.

Plate 145.

A TYPICAL FARM HOUSE ON RECLAIMED LAND IN HOLLAND.—This house, built by the Government, is ready for occupation under leasehold tenure. The farmer's living quarters (left) are attached to the barn and stables in which all stock are housed during winter.

IN THE ISLAND OF JERSEY.

As the party included many Jersey breeders, a very busy and interesting week was spent on Jersey Island. Most of the leading studs were inspected, many of which will be familiar to Queensland breeders.

It is to be regretted that herd recording has somewhat slipped back of recent years, but as American fanciers or their agents are continually buying up the best stock at high prices, many breeders contend that testing is unnecessary. Nevertheless, some excellent returns are recorded on the island. In the Goddington Competition, under four years, one breeder was awarded first, second, third, and fourth prizes for cows with the following totals, respectively:—723 lb., 721 lb., 713 lb., and 704 lb.

Plate 146.

Type of Jersey Cow on a Farm in the South of England.—This eye-taking matron has a very fine production record.

In an aged class, the winner produced 1,157 lb. of butter; the second cow had recorded 1,048 lb., and the third 797 lb. butter.

The dairy and cattle industry in Jersey has been surpassed in economic importance by the potato industry. During 1935 some 58,000 tons were exported, the net value being, approximately, £845,000. The climate on Jersey is very mild, the crops mature earlier than in England, and, therefore, demand a good price on the English market, approximately £13 to £14 a ton to the grower. At the time of our visit some 1,200 tons of potatoes were being shipped daily.

Plate 147.
Jersey cattle paraded for herd book entry, Jersey Island.

Fat Lamb Raising in Queensland.

J. L. HODGE, Instructor in Sheep and Wool.

FAT lamb raising should be a profitable enterprise for farmers with suitable country. From the point of view of returns, if properly practised, there is no quicker money in the whole range of sheep farming.

The districts most suitable for the raising of fat lambs from English type sheep are the Darling Downs and neighbouring country. There is no reason, however, why graziers further afield should not engage in the industry with profit to themselves, providing they cultivate.

Cultivation must be regarded as a prime necessity where fat lambs are the object. This is not to say that a crop of fat lambs may not be raised on natural grasses, but to do so is more or less in the nature of a fluke and the practice is not recommended. An appropriate slogan for this branch of the sheep industry is "The fat lamb follows the plough." The wheat farmer should certainly consider fat lamb raising as a complementary enterprise. Incidentally, its adoption would make a saving in cultivation costs.

Wheat, like the rest of the cereals, is an excellent sheep fodder. Oats probably give a longer feeding period. Lucerne, than which there is no better sheep feed, should have its place on the farm if conditions are suitable for its cultivation. It will do well on any well drained flat, where the rainfall is sufficient and frosts are not too severe. Every consideration should be given to introduced grasses and to pasture improvement, with especial application to winter feeds.

It should be remembered that the lamb must be maintained fat from birth to butcher's block. The ewes in lamb should be kept in good strong store condition. After lambing, no feed is too good for the ewe and lamb.

With regard to breeds, in Queensland it is admittedly difficult to obtain the right type of crossbred ewe. It, therefore, becomes necessary in most cases to breed the future mothers of the lamb raising flock. With this object in view, the farmer would be well advised to secure the boldest and strongest possible type of merino. Station ewes culled for broadness of fibre in the fleece are best suited for the purpose, with due regard for size and constitution. They should be mated with one of the English long woolled rams—such as the Romney Marsh, Border Leicester and Lincoln. The ewe lambs in the resultant drop should be saved as the future dams in the fat lamb raising flock. On these half-bred ewes it is advisable to put a Downs ram. Two breeds highly recommended are the Southdown and the Dorset Horn. Lambs got by the Southdown rams provide the most desirable carcases at the present time. The Dorset Horn, however, gets a very nice early maturing lamb from the ewes mentioned, and he has, besides, the additional value that, like the Merino, he will work at any time of the year. This is an important consideration, as it enables the farmer to have his lambing to suit his cultivation. The wool from ewes of these crosses is not to be despised, all of them being of value. However, it should be remembered in this connection that the fat lamb is of first importance, and the production of wool a secondary consideration.

Here a certain line of breeding has been indicated, but it should be realised that locality has much to do with the choice of a breed. For instance, the pure Corriedale ewe is an excellent all round general utility farmer's sheep. She is docile and a splendid milker and is recommended from every point of view. On the Corriedale ewe a Downs ram should be used. At the time of mating, the breeding ewes should not be too fat or a poor lambing may result. They should, however, be strong and vigorous. The rams should be in good condition.

Lambs bred as indicated and properly fed should be ready for slaughter at four months of age, or even before. Extraordinary weights are not looked for by the shippers, but, in this connection, it must be stated that in the local market heavy weights are paid for at very profitable prices. About 33 lb., if the lamb is properly fat and a true sucker, is the ideal weight for an export carcase. The true export sucker lamb must never be weaned. "Straight from the teat to the block" is the maxim in this trade.

In districts where, because of wet conditions, sheep would not ordinarily be depastured profitably, the Romney Marsh stands alone. Apart from other reasons, this may be accounted for by his ability to withstand fluke and footrot better than any other breed.

Prices for fat lambs in Brisbane have been consistently high over a period of years. It is not too much to expect that a ewe of the right type, and mated as advised, should produce £1 a year.

From every standpoint, the farmer with suitable country and cultivation will be well advised to give some thought to engaging in this very lucrative branch of sheep husbandry.

DRENCHING FOR WORMS IN SHEEP.

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

ABOUT this time of the year worms are usually very troublesome in sheep. Before drenching an effort should always be made to ascertain which species of worm is the cause of the trouble, and this can readily be done by a post-mortem examination of a badly-infested animal. The fourth stomach, small and large intestines, should be cut open and examined carefully, and if the animals are coughing attention also should be given to the lungs.

For the worm that occurs in the fourth stomach—the barber's pole worm—bluestone is recommended. Carbon tetrachloride is also very effective against this worm, but there is some risk attached to its use, and it is therefore no longer recommended by the Department of Agriculture and Stock.

Bluestone and nicotine sulphate is used for the removal of the small hair worms, which inhabit the small intestine. Hair worms are the cause of a disease known as "black scours." Infestation is most severe among young sheep in which the losses may be very heavy. Bluestone and nicotine sulphate is the only drench which is of any value against these small worms.

Where a mixed infestation of stomach worms and hair worms occurs —a frequent experience, especially in young sheep—the bluestone-nicotine sulphate drench should be given, as this drench is effective against the stomach worm also. Moreover, it may be used for the removal of tapeworms from lambs, although these worms may also be removed by arsenic and epsom salts.

For the nodule worms in the large intestine there is as yet no efficient method of removing them by means of drenches which are given through the mouth. They may, however, be combated by the use of an enema containing sodium arsenite, which, if administered carefully has a very high degree of efficiency.

Lung worms are treated with certain drugs which are injected into the windpipe, the formula being:—

Oil of turpentine—1 cubic centimetre.
Creosote—0·5 cubic centimetre.
Olive oil—2 cubic centimetres.
Chloroform—0·5 cubic centimetre.

This formula represents a dose for one adult sheep. For lambs the dose is reduced by one-half.

In country subject to worms the sheep should be given treatment at regular three to four-weekly intervals during the spring and summer months, for otherwise little or no benefit from the treatment may be evident. Treatment is to be regarded only as a temporary measure in the fight against worms, for it must be realised that when paddocks are heavily infested with worm larvæ the animal is no sooner freed of worms by treatment than it is attacked again by larvæ which are picked up by the animal when grazing. In about three to four weeks' time the larvæ have grown and have reached such a size and attained such numbers that the health of the animal is again affected.

Further information on mixing and administration of these drenches may be obtained from the Animal Health Station, Yeerongpilly.

CARE OF SICK ANIMALS.

Stock owners are frequently required to diagnose and treat sick animals and, from their constant observation of stock in good health, are quick to notice any abnormal behaviour due to sickness. A knowledge of the normal temperatures, pulse, and respiration rates of various animals is most valuable in arriving at a correct diagnosis of the trouble. The temperature of all young animals is somewhat higher than that of older animals, and various influences—such as periods of œstrum (heat), time of day, external temperature, and so on—may alter the temperature of the mature animal. The temperatures of healthy farm animals are:—Horse 99·5-101 degrees, cow 100-101 degrees, sheep 103 degrees, pig 102·5 degrees.

The temperature of an animal is usually measured in the rectum, and a self-registering thermometer, such as is commonly used in ordinary medical or nursing practice may be used. Care should be taken to see that the column of mercury is shaken down. A small quantity of vaseline smeared on the bulb as a lubricant to assist the passage of the instrument is desirable, and it is inserted with a circular motion between the fingers, forward in a line with the backbone, and allowed to remain for a few minutes before it is withdrawn carefully and the reading taken. If the temperature of an animal is found to be about 2·5 degrees above normal it is said to have a low fever, if it reaches the vicinity of 4 degrees above normal a moderate fever is indicated, and if in the neighbourhood of 6 degrees above normal it has a high fever.

In some diseases, such as tetanus and sunstroke, the temperature may be as much as 10 degrees above normal. Having decided by use of the thermometer whether the sickness is of a febrile (pertaining to fever) or nonfebrile nature treatment and nursing must be considered.

Good nursing is of the utmost importance. The patient should be provided with a soft bed, shade from sun, wind, or rain, and a rug in cold weather. A supply of water and green feed should also be provided if possible.

Medicines are usually administered by the mouth in the form of a drench, and it is necessary to use care and patience when using this method. The head of the animal should not be raised above a horizontal position, and only small quantities of the drench poured into the mouth at a time, allowing time for swallowing. Pinching the throat to induce swallowing should not be practised, and the head should be lowered if the patient commences to cough.

LAMB-MARKING.

For lamb-marking all instruments should be sterilised. Tetanus is always a risk in old yards and sheds. If the work can be done in grassed yards the risk of the entry of tetanus and other germs is reduced considerably. On large holdings it is always advisable, when practicable, to do the work in the breeding paddock, where temporary dust-free yards can be erected.

Marking should be done in early morning or late afternoon, and the sheep should be released as soon after as possible, to avoid any risk from germ-laden dust. The correct age for marking is from two to four weeks. Care should be taken to sever the tail at a joint. An antiseptic dressing should be applied.

BRUISING IN CATTLE.

The meat export industry is seriously prejudiced by the bruising of cattle when travelling to the meatworks, and the annual loss to both the owner and the State is considerable. Bruising is caused by many factors, particularly so when journeys are long, but the two chief causes are ill-treatment and horning because of faulty supervision during trucking and in transit.

Cattle travelled to market on the hoof always give a higher percentage of first-class beef than railed stock, provided, of course, they have the condition and weights essential for export. Much of the bruising attributed to train travelling is caused in the trucking yards. In many instances every endeavour is made to load the trains in a minimum of time. This is a mistake. Care should be taken to avoid crowding in gateways because, where jamming occurs, the outer beasts are bruised on ribs and hips. Precautions are necessary both at the crush entrance and in the crush. If cattle are trucked in ''single file'' their sides do not come in contact with the rails. Drovers in charge should insist that no unnecessary force is used to drive the cattle, for every injury affects the quality of the carcase.

Competition in the chilled and frozen meat trade to-day is keen, each competing country endeavouring to produce a better carcase. Therefore, if Australia is to retain or increase her output of first-grade beef, the cattle received at the meatworks must be of prime quality and free from injuries of any kind. Growers and dealers may assist the trade by judicious handling of stock. Dehorning is essential. This is a simple operation and should be done when branding. Records prove conclusively that polled cattle give a much higher percentage of first-quality beef than horned cattle.

Dehorned cattle are also much more docile in the paddocks, cover less country when feeding, and retain condition longer.

WINTER-GROWING RHODES GRASS MAY CAUSE STOCK LOSSES.

Although warnings have been issued to the effect that the so-called winter-growing or frost-resistant Rhodes grass is a potential source of danger to grazing stock, some farmers may not yet be aware that this grass should be grazed with caution. Winter-growing Rhodes grass should not be confused with the more common Rhodes grass which makes a very valuable pasture.

The prussic acid content of winter-growing Rhodes grass has been determined in samples collected both in Queensland and in New South Wales, and the quantity found was sufficient to indicate that the grass may sometimes be toxic to animals. Little is known regarding the conditions under which stock losses due to ingestion of the grass may occur, and stockowners are advised to exercise a good deal of care when paddocks of the grass are being grazed.

In districts where high-yielding winter-growing grasses and clovers can be grown, the use of the winter-growing Rhodes grass for grazing purposes is not recommended.

Herd Testing and Profits.

L. A. BURGESS, Dairy Research Laboratory.

THE problem facing all dairy farmers is the production of the maximum amount of butterfat at the lowest possible cost, at the same time maintaining or improving the fertility and carrying capacity of the pasture and health of the stock. The best results are only obtainable by a combination of three factors—the farmer, the pasture, and the herd. On the farmer rests the responsibility for efficient pasture management and on the stock that of producing the maximum amount of fat from the food consumed.

All thoughtful farmers must admit that good cows are essential to success. Many claim that they have good cows, and base their claim on factory returns. This, however, is only evidence that the herd as a whole is good and not that each individual member of the herd is producing enough fat to pay its way. A drop in factory returns is inexplicable to such farmers, and they are in a quandary as to where the remedy lies. The farmer who submits his herd to testing regularly can see by comparing the production records of cows and heifers whether the production is being maintained, whether the right cows are being used for breeding, and whether the herd sire is producing profitable or unprofitable progeny. By so doing, he is able to remedy the fault before it affects his factory returns to any noticeable extent.

The productive capacity of a cow can only be ascertained by testing. The figures obtained indicate her ability as a producer under the existing feeding and management conditions, which are controlled by the weather and the farmer. There is ample evidence available to show that the average herd contains animals which do not produce sufficient fat to pay for the food which they consume, and other animals which produce double or even treble that of the unprofitable cows. These latter cows are the ones which must be exploited to improve the yield of the herd.

Herd testing is essentially educational. The figures merely disclose the facts, and the responsibility is upon the farmer to carry out the necessary remedies. A farmer who neglects to cull unprofitable animals

has only himself to blame for a stationary or decreased production. Failure to act on the part of the farmer cannot possibly be construed as a failure on the part of herd testing.

An actual case of well-applied herd testing is as follows:—

A herd of thirty-four cows averaged 194 lb. of fat, total 6,596. At the end of the season no fewer than twenty-six animals were culled.

In the next season the herd reduced to thirty-one members (eight cows retained from previous season plus five tested pedigree and eighteen heifers from tested cows) averaged 307 lb. of fat, total 9,517.

In the third year the thirty-one cows averaged 340 lb. of fat, total 10,540 lb.

In this case the actual production from the same grazing area rose from 6,596 lb. to 10,540 lb. of fat. The fat per acre was thus nearly doubled; and, with fat at 1s. per lb., the income rose from £330 to £527.

Herd testing will pay handsome dividends, provided that the farmer does his share.

THE IMPORTANCE OF BLENDING OF CREAM.

An examination of cream on the receiving platform of almost any factory will indicate the necessity for careful treatment and storage on the farm. Proper blending of the cream after separation is essential.

The process of cream ripening assists the production of delicate butter flavours.

The development of lactic acid in the cream is desirable, because the lactic acid bacteria, if present in large numbers, prevent the undesirable off flavours and taints from developing.

Small quantities of cream are more difficult to hold in a satisfactory condition than larger quantities, and, consequently, the dairy farmer should keep his supply in as large a bulk as possible.

Objections to blending have been raised by some dairy farmers, who claim that if the cream from each milking is kept separate only portion of the supply will be graded second-grade when sent to the factory. To this objection, however, it might be stated that the aim of dairy farmers to-day is, or should be, to have all and not merely part of their cream of the highest "choice" quality.

To blend correctly the cream from each separation is first cooled for about an hour before adding to the bulk supply, which should always be kept as cool as possible.

If the use of the cooler and aerator has been effective the cream should then be ready for blending—the farmer must satisfy himself, however, in all cases that the cream is sufficiently cooled before attempting to add it to the bulk.

Thorough and frequent stirring with a metal stirrer is necessary for correct blending.

If two or more cans are to be sent to the factory, approximately equal portions of the cooled cream from each separation should be placed in each can. This will ensure that a standard cream is supplied.

—*E. B. Rice.*

CLOVERS ON THE COAST.

A marked increase in milk production in late winter and spring when white clover is plentiful in the pastures is a common experience in coastal dairying districts. Unfortunately, it is not every year that weather conditions are favourable for the development of a good growth of clover in unimproved paspalum pastures.

Generally, the requirements of clovers are a fertile and not too acid soil and a fair supply of soil moisture. Where white clover is naturally abundant in paspalum pastures it may be taken for granted that its requirements are supplied, but it is true that the production of thousands of acres of paspalum pasture could be improved by the encouragement of clover growth.

Soils which are distinctly acid can only be made suitable for clover growth by the use of lime. If the fertility of the soil has been lowered by many years of grazing, it is advisable either to renovate with the plough or paspalum renovator and top-dress with fertilizers. On suitable areas it may be preferable to plough out the pasture and grow a green manure or some other form of crop prior to resowing the area with a mixture of grass and clover seeds. Renovation and green-manuring practices, in addition to increasing soil fertility, also tend to increase the water-retaining properties of the soil.

In all cases where pasture has been renovated, or where new permanent pastures are to be sown, it is advisable to add clover seed to the pasture. The clovers which have proven themselves of outstanding usefulness for incorporation in permanent pastures are white clover and red clover, and both should be included in permanent pasture sowings on the sub-tropical coast. White clover provides good grazing from about August until November, while red clover makes the bulk of its growth from September till March. Compared with white clover red clover is a short-lived plant, and dies out in a pasture within two or three years. It is of great use, however, in providing feed during the first year while the white clover is establishing itself.

When sowing on renovated paspalum or in new pasture mixtures about 1 lb. per acre of each of the clovers should be used. New Zealand strains of white clover are superior to European or local strains of which commercial seed is available; the best seed to use is New Zealand Government-certified white clover seed. New Zealand strains of red clover also are preferable to other commercial types.

—*C. W. Winters, B.Sc.Agr.*

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Charcoal for Pigs.

DIGESTIVE efficiency in farm animals depends largely on their ability to grind their food well. Thorough mastication is therefore linked with ease of digestion. Some animals may eat food rapidly without ill-effects. Thus the domestic fowl swallows quickly, but it has a remarkable mechanism in the gizzard for grinding the food to a fine state for subsequent digestion and absorption.

The pig is not so well equipped as the fowl to handle rapidly-eaten food, yet under most farm conditions fast eating is the rule. The pig can be helped to make better use of its foods in the following ways:—

(i.) By feeding easily digested material;

(ii.) By grinding the less digestible foods;

(iii.) By ensuring the animals sufficient feeding room;

(iv.) By arranging for some open grazing where the animals may eat at their leisure;

(v.) By feeding aids to digestion.

It is the last with which this note is concerned.

Charcoal and coke are extraordinarily cellular in structure and possess a great number of surfaces. At these surfaces rapid digestion of food can take place. By feeding either of them in powdered form, coarse lumps of food become coated with a film possessing an actively digesting surface.

An alternative and cheaper method is to throw coarse charcoal or coke into the pig sty and let the animals grind and eat as they feel inclined.

REGISTRATION OF HATCHERIES.

Following is a list of persons who have applied for registration of their hatcheries under the provisions of "*The Diseases in Poultry Acts*, 1923 *to* 1937." The list has been compiled up to and including 21st March, 1938 :—

Name.	Name of Hatchery.	Breeds Kept.
G. Adler, Tinana	Nevertire	White Leghorns, Australorps, White Wyandottes, Rhode Island Reds
F. J. Akers, Eight Mile Plains	Elmsdale	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville	White Leghorns
R. B. Corbett, Woombye	Labrena	White Leghorns and Australorps
Mrs. G. Crawford, Stratford, *via* Cairns	Rho-Isled	Rhode Island Reds
Rev. E. Eckhart, Head street, Laidley	Laidley	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah	Woodlands	Australorps and White Leghorns
Gisler Bros., Wynnum	Gilser Bros.	White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lambert's	Australorps and White Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
W. J. Martin, Pullenvale	Pennington	Australorps, White Leghorns, and Black Leghorns
J. A. Miller, Charters Towers	Hillview	White Leghorns
F. S. Morrison, Kenmore, *via* Indooroopilly	Dunglass	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood	White Leghorns
J. McCulloch, White's road, Manly	Hinde's Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
G. Pitt, Box 132, Bundaberg	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes Sussex, Rhode Island Reds, and Brown Leghorns
E. E. Smith, Beerwah	Endcliffe	Australorps and White Leghorns
T. Smith, Isis Junction	Fairview	White Leghorns and Langshans
H. A. Springall, Progress street, Tingalpa	Springfield	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere	White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's	White Leghorns, Brown Leghorns, and Australorps

Worms in Poultry.

F. H. S. ROBERTS, D.Sc., Animal Health Station, Yeerongpilly.

MANY young birds will now be commencing their first season of production. During the rearing of these birds diseases such as coccidiosis, pullorum disease, and roup will have taken their toll. These diseases are spectacular in their onset, and the symptoms manifested and the mortalities experienced have compelled the poultry farmer to undertake control measures in order to minimise his losses as much as possible.

In many instances, however, worm infestation has been overlooked. The effects of worm infestation are usually insidious in nature, and being accumulative do not attract attention until the birds are seriously affected. Such effects include failure to make normal growth and even loss of weight, loss of appetite and activity, dull, ruffled plumage, and a paleness of the comb and shanks. The mortality, especially among young birds, may be serious. More important, still, young pullets, while maintaining a ravenous appetite and being apparently in fair health, may not be producing their normal quota of eggs.

Of the various worms which infest poultry one of the most important is the large roundworm, which grows up to 4 or 5 inches in length, and is found in the intestine. Where the farmer pays careful attention to sanitation and cleanliness, this and other worms rarely become dangerous by the regular removal of droppings and the adoption of other measures which promote cleanliness, the source of infestation is removed. Prevention of infestation is most important in the control of parasitic worms. There are, however, certain drugs which may be employed to remove the worms from the birds, and if treatment is employed regularly the infestation should be of no great importance. Treatment of poultry for worms may be undertaken either by mixing certain drugs with the mash (flock treatment), or else by giving the drug to each individual bird (individual treatment).

Flock Treatment.—Flock treatment can be applied with success only when the birds are kept under intensive or semi-intensive conditions. The procedure is to mix nicotine sulphate with the mash at the rate of ·5 cubic centimetre of nicotine sulphate for every 1 lb. of dry mash. The amount of nicotine sulphate required is incorporated with just sufficient water so that when mixed the mash is flaky. About 1 part of nicotine sulphate to 400 parts of water is usually adequate. The mixing should be thorough so that no lumps remain. This treated mash is mixed fresh daily and fed continuously for four days.

Individual Treatment.—The best drug to use for individual treatment is carbon tetrachloride. This may be given in capsules or by means of a syringe and rubber tubing. The birds are starved overnight and treated next morning. They may be fed immediately after treatment. The doses range from ·5 cubic centimetres to 2 cubic centimetres, depending on the size of the bird. If the syringe is used great care must be taken to avoid delivering the drug into the windpipe, which would cause instant death. Before undertaking this treatment farmers should apply to the Animal Health Station, Yeerongpilly, for further details.

MARKING EARLY LAYING PULLETS.

The marking of early laying pullets provides a practical method of selection where the trap nest is not used.

Records obtained by trap nesting in various parts of the world show that—

(1) Early laying pullets are, as a rule, the highest producers;

(2) Birds that lay late into the autumn and are late in moulting are also high producers.

As the early layers and late moulters are high producers, a marking system will assist in distinguishing between profitable and unprofitable fowls.

In one convenient system of marking a coloured leg band is placed on the left shank of all pullets which start to lay before six months of age. A band of another colour is attached to the left shank of pullets starting to lay when six and seven months of age, and a third coloured band is used for fowls which commence to lay in the eighth month. Pullets that do not lay until after the eighth month should be culled from the flock, or kept in a pen by themselves, and forced for egg production.

Pullets which are early layers show the following characteristics:—

(1) A large red comb;

(2) An active disposition and a ravenous appetite;

(3) Roominess between the keel and pelvic bones;

(4) An occasional disappearance of the yellow colouration round the vent in some yellow-shanked varieties.

In small flocks individuals showing the abovementioned characteristics may be caught in the nests and then marked.

During the following season all fowls which were marked as late maturing the previous autumn and moult in December, January, and February may be culled. All the early laying birds and those that moult after 1st March may be kept for layers or placed in a special breeding pen and mated to a male known to have come from a high-laying hen that has been trap nested. In this way the egg production of the offspring may be raised.

The method outlined provides a simple method of selection which will, properly used, raise the level of production in a flock.

—*P. Rumball.*

AUTUMN HATCHING.

The term autumn hatching is usually applied to incubation practised during February, March, and April.

Many poultry raisers may be considering the advisability of autumn hatching during the coming year because of the shortage in the number of chickens raised during the past hatching season. Before adopting this practice, consideration should be given to the financial returns that may be expected from autumn hatched stock.

Most of our commercial breeds reach maturity within six months; consequently chickens hatched during the autumn come into production during August, September, or October. Egg prices at this period of the year are usually around about 1s. per dozen, gross, for first-quality eggs. Pullets, however, do not produce a first-grade egg with respect to size, and there is a tendency for autumn-hatched chickens to lay eggs of a smaller size than if the birds were hatched during the winter and spring of the year. Consequently, the demand for autumn-hatched stock during the glut period will not equal that for stock hatched in the usual season. In addition, during that period of the year when eggs vary in value from 1s. to 1s. 9d. per dozen, autumn-hatched stock will be growing and not producing.

It may be claimed that the autumn-hatched stock will produce eggs in plenty during late summer when egg values are fairly high, the birds moulting late. This cannot be depended upon, for many moult at the usual period.

With the relatively good prices for table poultry—and it is reasonable to assume that good prices will be obtainable for table poultry during the winter of 1938—some justification may exist for the raising of birds that are for table purposes only. This, however, is dependent on the value of fodders. In experiments at the Animal Health Station, it has been ascertained that the following quantities of fodder are required to raise cockerels to the various stages of development:—

Age.	White Leghorns.		Australorps.		Light Sussex.	
	Bird's Weight in Oz.	Food Consumption for Period in Oz.	Bird's Weight in Oz.	Food Consumption for Period in Oz.	Bird's Weight in Oz.	Food Consumption for Period in Oz.
Day-old ..	1·3	..	1·36	..	1·23	..
3 weeks ..	5·31	9·80	5·84	9·9	6·59	10·17
6 weeks ..	12·92	32·8	15·86	34·61	17·03	30·34
8 weeks ..	21·4	54·74	27·5	63·61	27·2	62·74
12 weeks ..	34·7	116·92	49·1	140·39	47·3	144·84
16 weeks ..	47·8	180·02	72·4	226·49	70·4	245·84
18 weeks ..	51·1	215·86	85·0	277·88	83·6	288·94
21 weeks ..	..	..	98 7	358·83	96·8	403·54

The poultry raiser who contemplates hatching poultry for table purposes during autumn should carefully consider the prospects of profitable engagement in this business by calculating the costs from this table, having due regard for the market value of fodder.

THE PURCHASE OF POULTRY.

At this time of the year the upward trend of egg values tempts many beginners, and also persons who keep a few fowls, to increase their income from poultry by purchasing pullets or hens. The idea is fairly sound, but there are numerous pitfalls for the inexperienced buyer.

Assuming that the beginner sets out to buy pullets about four or five months old, it is only natural to expect that the quoted price will have an important bearing on the transaction. For instance, if pullets four to five months old are obtainable from one source at 6s. per pair, and from another at 10s. per pair, the cheaper lot may be bought.

The inexperienced buyer seldom appreciates the necessity for paying the higher price, as the birds are of the same age and breed. It should be borne in mind, however, that there is usually a definite reason for the difference in the price, and that difference can be summed up in one word —quality. The cheaper birds may be culled from flocks, as the result of their being backward or stunted in growth. Such birds cannot be expected to commence egg-laying at the normal time and be profitable. As they are culls as pullets, it is unwise to breed from any of them. They cannot return a profit, irrespective of the purpose for which they are used.

After allowing for feeding costs and a slight increase in egg values, it is unlikely that the more expensive birds will show any profit during their pullet year. It is quite probable, however, that they will repay their purchase price. At the same time, many of these birds should make suitable breeders, and their use for this purpose would be profitable.

Much the same situation applies in the case of hens. Cheap hens are usually unsuitable as breeders, whereas many breeding birds may be selected from the more expensive birds. The purchase of old hens is not good business, apart from their value as future breeders. Again, while the beginner may be able to distinguish a pullet before it begins laying, once production starts it is more difficult to separate hens which have just completed a moult and pullets which have been laying for a few weeks. It is also very difficult to distinguish between a hen that is fifteen months old and one four years old. This means that in buying alleged first-year hens the birds could be any age above that mentioned.

In such circumstances, it is advisable for the prospective buyer to inspect the flock from which it is proposed to make the purchase before parting with his money.

—J. J. McLachlan.

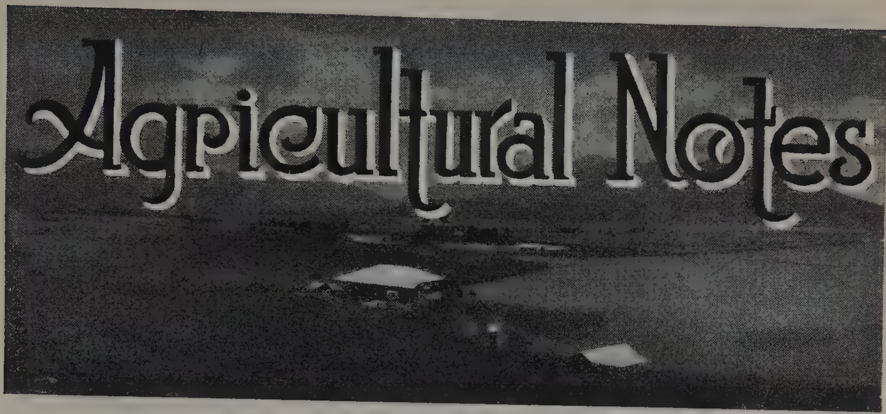
RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.10 a.m.



Harvesting Cotton.

R. W. PETERS, Cotton Experimentalist.

THE methods adopted in picking cotton have a decided effect on the quality of the lint produced, for excessive cleaning during the process of ginning both damages the fibres and adds to the expense of spinning yarn of high quality. The harvesting of cotton, therefore, should be carefully carried out.

Picking should be commenced as soon as sufficient bolls are open to allow a moderate daily tally being obtained. Cotton should not be picked when it is either wet or green, the latter term describing fibres that have not dried out thoroughly following the opening of the boll.

Wet cotton is difficult to gin, for the fibres tend to stick to the saws, which either cut them or twist them into a ropy state. It is also difficult to clean leaf and trash from either wet or damp cotton. In most seasons in Queensland, no difficulty should be experienced with wet cotton, for the usual climatic conditions are suitable for the harvesting of dry cotton after the dew has dried. Where picking is done while the dew is still on the crop, the wet cotton should be spread out in the sun during the forenoon, after which it can be baled with the rest of the picking for the day.

With the present efficient ginning machinery it is not necessary to have the cotton as nearly "snow white" as formerly in order to obtain the best grades. This is very helpful where the farmer and his family pick the crop, and it is suggested in such cases that it would be better to pick the cotton slightly less cleanly and thereby faster, for not only could greater tallies be obtained in the harvesting period, but larger acreages could be grown and still harvested without employing outside labour.

Early picked cotton may contain a fair amount of big leaf and still yield lint of high grade, for the cleaning machinery removes the big leaf without breaking it to any great extent. It is a mistake, therefore, to try and exclude leaf by very careful picking, or, worse still, to break up large leaf by rolling the cotton between the hands. Small pieces of leaf are difficult to remove during ginning, and seed cotton containing fine pieces of leaf—or "pepper" leaf as it is termed—is graded lower

than cotton with only big leaf. Hence grades usually drop off after heavy frosts—the dead leaves and bracts are so brittle that they break into small pieces when picked with the cotton. While modern cleaning machinery eliminates most of this leaf, the remainder is sufficient to necessitate lower grading than if the leaf was large and not brittle.

Grass and weed seeds, especially spear grass seed, are particularly difficult to remove from cotton lint, and every effort should be made to clean the fields at the last cultivation so that no seed will be produced. On old cultivations, even where good farming practices have been followed, there is always danger of tall-growing weeds setting seed late in the season, and it pays to chop them out before the harvesting commences, especially if pickers are employed.

Cotton ready for picking should not be exposed too long to the weather. When the bolls first open, the lint has a rich colour or "bloom," and this "bloom" is essential for the higher grades of the regular universal standards. Cotton which is left unpicked for several weeks loses its "bloom" through bleaching caused by wetting by dews and the subsequent drying by the sun. The colour changes to a chalky dead white and the lustre of the fibres is destroyed. The effect of rain on cotton is particularly severe—the colour changes to a dull greyish or light bluish tinge during rains which last several days. Cotton should not be picked for several days after rain, for the bleaching action of the dews and sun greatly improves the colour, while the wind and heat of the sun fluff out the fibres from the matted condition caused by the rain.

Winds have a detrimental effect on a well-opened crop, for the locks tend to hang out of the bolls in a long, stringy condition. The cotton not only dries out excessively, but the fibre quality suffers, and the cotton is difficult to gin properly owing to a considerable proportion of the locks being in a twisted rope-like condition. Cotton left exposed to windy weather also usually gathers up bits of broken bracts and leaves. In addition to these disadvantages, some of the cotton is shed during heavy storms.

Where the harvesting is done by the grower and his family, it will usually pay to make several pickings in a good crop. Where labour is employed to harvest the crop, sufficient bolls should be open to allow the picker to make a reasonable tally, otherwise the cost of picking will be high. In these circumstances, one good picking followed by a clean-up is sufficient in fields of light to medium yield. With good crops, two or more pickings and a clean-up may be necessary. The grower should be guided by the conditions as they exist. Sometimes it is more profitable to allow a heavy picking to open and thus get it picked cheaper than if a lighter picking were made.

FARM MACHINERY CREATES JOBS.

It has been amply demonstrated over and over again that labour-saving devices set us free from hard labour, and long hours. The argument that labour-saving machinery throws men out of work has been generally disproved. With farming, there is direct proof that modern machinery creates jobs instead of destroying them. Modern farm machinery will pay for itself in more and faster and better work. Its construction gives work to the miner, mechanic, and distributor who, after all, constitute a large proportion of the farmers' home market.

Packing and Consigning Cotton.

R. W. PETERS, Cotton Experimentalist.

BECAUSE of the distance of the cotton fields from the ginneries in Queensland, the crop is forwarded by train either in bags or wool packs containing around 80 to 100 lb. and 500 lb. of seed cotton respectively. The growers of small acreages generally use second-hand corn or chaff bags, while those with more than 5 or 6 acres usually purchase once-used wool packs for their crop. It is cheaper to use the wool packs, for they are returned to the grower on payment of a small fee, which covers the cost of freight and heating to kill the pink boll worm or any cotton pests in them.

Before filling, the container should be cleaned carefully to remove everything that might affect the grade of the cotton. Wool packs which have had cotton in them should be especially cleaned in order to protect the purity of seed. Undoubtedly, much contamination of pure seed varieties can be brought about by seed cotton sticking in the corners of bales or becoming attached to strands of the sewing along the edges.

When packing a container, every care should be taken to have only the one grade and staple of cotton in it. A bale of lint is sold on the basis that it contains cotton of uniform grade and staple length. If there is any variation in the contents, it is purchased on the basis of the lowest grade and shortest staple contained. Growers should always try to obtain uniformity of contents in the bale of lint.

Many large growers allow the pickers to empty the contents of the picking sacks directly into the wool packs, and because of the variable efficiency of the pickers, layers of different grades may be found in the one pack. The cotton in each picking bag should be roughly classed by the grower and an endeavour made to segregate the different grades into separate wool packs. The grading at the ginneries can then be done more quickly, as it will be unnecessary for the grader to stop and estimate the true value of a wool pack containing different grades of seed cotton. In addition, more uniform cotton is fed to the gins, thus enabling the production of bales of lint containing only one grade in each. Usually two or three grades are ample, for, with the exception of droughty spots or places of rank growth, the quality of the crop over a field, if picked in a short time, is more or less the same. By using separate bales for good cotton, leafy cotton, and cotton which is insect-stained or from drought-affected plants, a grower will not only obtain the full value of his crop, but will facilitate operations at the ginnery.

Every grower has a registered number, and he should include this with his initials and railway station in a brand for identifying each container sent to the ginnery. The brand should be placed in a conspicuous place on the side of the container in black that will not rub or wash off. Each season some wool packs are received at the ginnery which have no identification marks, or with brands so indistinct as to be illegible; and it is only through checking up the advice notes which a grower despatches to the Cotton Board when consigning his cotton that the ownership can be established. This slows up the work at the ginnery and should not occur, for it is a simple matter to brand the cotton correctly.

It is necessary to know the variety of seed cotton in each container received at the ginnery, in order to determine the estimated percentage of lint contained in it. This information is required because the grower is paid on the basis of the amount of lint he forwards and the grade and staple thereof. Where a grower has only one variety no label is necessary, as this fact is recorded at the ginnery, but in the case of more than one variety tags for each should be used. When more than one variety is grown on a farm great care must be exercised to prevent the mixture or loss of identity of the varieties, and each container should be carefully labelled with the proper tag for the variety it contains. The label should be sewn on in the usual cross diamond method, which protects it from being torn off.

SEED MAIZE SELECTION.

As like tends to beget like, the necessity of selecting seed from ears of desired type and known parentage is obvious. Some farmers, however, do not realise the importance of this, and are satisfied to sow seed of any breeding, provided the grain is sound and germinates readily. Uniform tasselling and maturity cannot be expected from such seed. When times of tasselling do not coincide, there is poor fertilization of late-maturing plants and reduced yields follow.

The general improvement of a crop and the rapid elimination of undesirable characters can only be brought about by a regular process of seed selection. Isolation of the growing crop is necessary to ensure that cross-fertilization with maize in neighbouring fields does not occur. This is all the more important because wind and insects frequently carry pollen over long distances. Where isolation is not possible, sowings may be arranged so that tasselling times do not coincide.

It has been proved beyond doubt that locally-grown seed is more suitable for planting than comparable supplies of the same variety secured from outside sources. Farmers should, therefore, endeavour to improve their own seed by rigorous selection from year to year—provided, of course, the variety grown is continuing to give satisfaction—rather than buy seed annually, which cannot always be guaranteed as to its type and purity.

Seed selection may be carried out by the grower in both the field and barn.

Field selection is the better way, and it can be done conveniently when the corn is being pulled. More essential characters can be taken into consideration during field selection than are possible in the barn, where characters in the cob are alone considered. In the most rigid field selection the characteristics of only one parent can be determined, but even so seed selected from plants showing the following characteristics should give the best possible crop in the coming season:—

(1) The crop should have matured naturally, be thoroughly dry, and free from disease.

(2) Ears, when compared with the stalk, should be comparatively large and selected from those plants remaining upright.

(3) One good single ear to a plant is better than two mediocre ones, but where possible select from a plant with two good ears.

(4) Position of the ear on the stalk is important, for if too high from the ground harvesting is difficult and the risk of lodging is greater. If too low there is a danger of loss through weed overgrowth and also slow drying out in showery weather.

(5) Most varieties sucker to a greater or lesser extent, but the smaller the sucker development the better the plant.

(6) The ears should be firmly attached to the stalk and droop when ripe. The point of the cob should be well covered by the husk as a protection against insects and weather.

(7) The cob itself should be of moderate size, both in length and thickness, cylindrical (not tapered) in shape, having a well-filled butt and tip, yielding when threshed a high percentage of grain. Such cobs are much heavier than the average.

(8) The grain itself should be typical of the variety, uniform in depth and shape, and tight on the cob in regular straight rows.

Of all the characteristics in the grain, the farmer can least afford to overlook mixed colour, for maize showing this defect sells at a disadvantage if the crop is sold in the open market.

SOWING OF WINTER PASTURES.

Many farmers are now preparing land for sowing winter pastures to provide grazing during winter and spring. The sowing of winter pastures should be done during late March or in April. Later sowings will be successful only if exceptionally good seasonal conditions are experienced subsequent to sowing. Annual winter pastures, which are being sown for the sole purpose of providing feed during the present year, must go in early if a long grazing season is to be obtained.

If through dry weather, or some other circumstances, the preparation of land intended for winter pastures has not been done thoroughly, and a fine seed-bed is not available, the sowing of permanent winter pastures is not recommended. Instead, an annual pasture should be laid down, and after the land has been ploughed in the summer the area should be well worked for autumn sowing with a permanent pasture mixture in 1939.

Winter pastures should be sown only on land of at least fairly good fertility. If success is to be achieved with valuable grasses—such as *Phalaris tuberosa,* perennial ryegrass, Italian ryegrass, and prairie grass—it is essential that the soil should be of good quality. Land not quite up to first-class standard may support Wimmera ryegrass and cocksfoot pastures, but infertile and roughly prepared land cannot be expected to maintain a good winter pasture. Cultivation areas which have been ''cropped out'' should not be put straight down to winter pasture, as is often done, but should have their lost fertility restored to some extent by green manuring.

The winter-growing pasture plants available for use include perennial species—such as *Philaris tuberosa,* perennial ryegrass, cocksfoot, red clover, white clover, and lucerne, and annual species, including

Italian ryegrass, Wimmera ryegrass, prairie ryegrass, and Berseem clover. Not all of these plants are, of course, suited to all districts, but recommendations regarding suitable mixtures for most localities in the southern dairying and agricultural districts are available on application to the Department of Agriculture and Stock.

—C. W. Winders, B.Sc.Agr.

CATERPILLARS ON LAWNS AND GRASSLANDS.

In most districts in and about the Brisbane City area, grass-feeding caterpillars are at present infesting both lawns and pastures. Brown patches, sometimes quite extensive in area, are very noticeable, and on examination caterpillars of various sizes up to 1½ inches in length may be found sheltering among the grass stalks or low down in the turf. The caterpillars are the progeny of greyish-brown moths, often seen around the lamps at night. The caterpillars feed on the leaf-blade and, while the grass is not permanently injured, the appearance of a lawn is spoilt for the time being and the grazing value of pastures may be seriously reduced. More than one insect is involved, but the information given here has sufficiently general application. Various types of parasitic wasps are taking toll of the caterpillars, but it is advisable to supplement their work by applying suitable control measures.

A convenient bait may be made up in the following manner:—Thoroughly mix 1 oz. Paris green or arsenate of lead into 1½ lb. dry bran. Dissolve 4 oz. molasses, treacle, or honey in 1 pint water. Then pour the sweet fluid over the poisoned bran and mix the whole to a uniformly moist loose mash. The mixing would be conveniently done in an old bucket or circular wash-tub.

The freshly mixed bait should be distributed preferably in the late afternoon, as the caterpillars shelter mainly by day and feed over the surface of the ground by night. The bait should be scattered very thinly by hand by vigorous broadcast throws. Correctly mixed loose bait will scatter and fall to the ground as individual flakes. The quantities given provide sufficient bait for the treatment of about 150 square yards.

Precautions should be taken to ensure that children and pets do not have access to the poison or to the mixed bait or mixing tins, and poultry should not be allowed on the baited ground. Any vessels used should subsequently be thoroughly washed out. The thorough use of a nail brush in washing the hands immediately after the bait has been handled will be the final precaution required.

If extensive areas need to be treated, the following larger quantities might be mixed:— 1 lb. Paris green, 25 lb. bran, 4 lb. molasses, 2 gallons water. These materials would make up sufficient bait for the treatment of about ½ acre. However, any dairyman who intends carrying out baiting work on a grazing area should obtain further information from the Entomological Section, Department of Agriculture and Stock.

—J. A. Weddell.

PREPARATION OF WHEAT LAND.

Widely distributed rains since December have enabled farmers to go on with the preparation of wheat lands. Fields ploughed during December will now be in good physical condition, provided weed growth has been controlled by judicious cultivation.

Where sheep have access to the fallowed areas weeds will not be troublesome, but elsewhere every effort should be directed towards the eradication of all such growths. If it has been possible to control weed growth, all workings following the initial ploughing can be done entirely with rigid tine cultivators, or spring-tooth implements, and with harrows. Cultivation to the desired depth in order to break the crust and form a good surface mulch should be done soon after all substantial rains. As a firm seed-bed is required, it is important to progressively reduce the depth of working towards seeding time, particularly where sheep are not available to assist in consolidation.

Well-prepared land containing ample reserves of moisture is often fit for sowing at a seasonable period, according to the variety selected, independently of favourable rains. On the other hand, hurriedly prepared land may have to await later rains to effect germination—a great disadvantage, for early or seasonably sown crops invariably give the best average returns.

The wheat yield for the 1937 season exceeded the average annual return for the previous decade, despite somewhat adverse seasonal conditions, a fact which can be attributed largely to the increased attention being given to the thorough preparation of the land. The growers who consistently practise summer fallowing have been amply rewarded for their efforts during recent years when winter and spring rains have been under average, a fact which cannot have escaped the attention of neighbouring farmers.

Where wild oats and other weeds are assuming pest proportions, it is suggested that the land be sown to a good fodder oat, which can be grazed as required, ploughing in the residue in sufficient time to prevent the maturity of wild oat seed.

Weed infestation during the following year can thus be greatly reduced, besides providing valuable feed, and a rotation crop of benefit to the land.

—*R. E. Soutter.*

ESTABLISHING LUCERNE.

Lucerne is grown for hay purposes chiefly in warm districts on deep calcareous soils provided with abundant moisture. In such situations heavy crops are produced over a number of years. Within recent years the cultivation of lucerne has been extended into fairly dry districts, but most success may be expected on soils rich in lime and with ample moisture available to the plants.

Land intended for lucerne is best cropped with a cereal—such as wheat, oats, barley, or rye—or panicums and millets—prior to its preparation for lucerne. Stubbles should be cultivated to induce volunteer growths of weeds and other seeds; these should be turned in subsequently by ploughing. For a first cultivation, two deep ploughings

should be given at right angles to each other. Moisture should be conserved by frequent cultivation. In dry districts, where a good rainfall cannot always be depended upon at seeding time, fallowing is particularly necessary for the purpose of conserving moisture. The land may therefore be ploughed in late autumn or early winter the year before it is intended to sow. The depth of the ploughing is governed by the character of the soil. Alluvial soils should be ploughed to a depth of about 7 inches, but on other classes of soil of lighter or more porous nature a depth of 4 to 5 inches is sufficient. The ploughed land should then be allowed to lie in the rough state for a month or so and be broken down with harrows after summer rains. During summer the land should be frequently worked with harrows or cultivators, so as to allow neither growth of weeds nor the formation of a hard crust on top. If the seed-bed cannot be worked down sufficiently fine with the harrows, a one-way disc cultivator or roller will do all that is necessary. If the land is rolled, it should be harrowed immediately after the rolling. Where the soil surface shows a tendency to dry out just prior to sowing, a light ploughing may be given and followed by the harrows. Sowing on top of the harrowed surface, followed either by a light rolling or by brush-harrowing, is a good practice—but if rolling is adopted, a set of light harrows should be used immediately afterwards. Rolling assists in bringing the soil particles in closer contact with the seed and works in the same manner as compressing a partly dried-out sponge.

Lucerne is best sown in April or May, the young plants then being sufficiently well established before the onset of cold weather to enable them to survive. Provided the seed is drilled in, a sowing rate of 12 to 14 lb. per acre is ample, and often too much, in the best lucerne-growing districts. If hand broadcasting is practised, slightly more seed should be used. The rate of seeding should be lighter in dry districts, and for grazing purposes a seeding of as low as 2 lb. per acre is permissible. Seed sown on the surface should be covered by means of a light harrowing.

Though fertilizers are not used to any considerable extent in the main lucerne-growing areas, many growers have obtained payable results by applying up to 1½ cwt. of superphosphate per acre, either drilled in with the seed or used as a top-dressing. Nitrogenous fertilizers appear unnecessary.

Fully a month or six weeks will pass before the young root system becomes established and the lucerne is fit for its preliminary cutting by the mower. An early mowing before the young lucerne flowers acts as a pruning and stimulates the root growth. After the preliminary cutting, a light harrowing may be made if absolutely necessary because of foreign growths.

Often promising stands of lucerne, following good germination, are destroyed through cutworm attacks. Damage at this time is irreparable, for the blank spaces are filled with weeds which considerably lessen the value of the crop. The Paris green-bran cutworm bait broadcast at the rate of 30 lb. per acre gives effective control, provided it is distributed as soon as the depredations of the pest become apparent. The necessary materials should therefore be held in stock on the farm for emergency. Cutworms attack only very young lucerne, and intelligently applied bating is then quite safe. Bait distribution in established crops is undesirable on account of the possible risk of stock poisoning.

Wetting, Spreading, and Sticking Properties of Insecticidal Spray Fluids.

THE successful application of insecticidal sprays depends on their ability to destroy the insect, without harmful effects on the treated plant, at a cost that can be borne by the product to be marketed.

Success in spraying is, therefore, in large measure dependent on the ability of the operator to obtain a maximum degree of efficiency with a minimum expenditure of spray fluid. This desirable objective will be achieved only when the sprayed surface of the plant or insect is thoroughly, intimately, and evenly covered with a thin film of the spray fluid. In addition the toxic element of the spray should remain on the sprayed surface for a sufficient period of time to achieve the objective for which it was applied.

Some spray fluids do not in themselves possess satisfactory wetting and spreading properties, no matter what plant they are applied to, while such plants as the cabbage and such insects as mealy bugs present decided difficulties in spray application.

Where it has been found impracticable to obtain the desired degree of efficiency in the application of the spray fluid it has become the practice to add supplementary substances known as spreaders and stickers.

The power of a supplementary substance to wet a surface may depend on its ability to produce chemical changes therein, e.g., a solvent effect may be produced on the waxy coating of the cabbage leaf or mealy bug. Its wetting power, however, may be dependent on a physical interaction between the spray fluid and the sprayed surface. Whatever be the case, one objective of the supplementary substance is to ensure thorough wetting, i.e., intimate contact between the spray fluid and the sprayed surface.

A further essential in the supplementary substance is its ability to ensure that the sprayed surface is completely covered with a film of spray fluid. The achievement of such an objective means that the spray fluid will not become aggregated in droplets, a development which would leave much of the surface unprotected or many of the insects untreated.

Wetting and spreading are not just one and the same thing, but a single supplementary substance may frequently produce both effects in a spray fluid that is deficient in wetting and spreading properties, and it is generally referred to as a spreader. Soap, saponin, gelatine, and calcium caseinate have been used as spreaders, but before adding a spreader to a spray the operator should satisfy himself that the addition can be made without reducing the toxicity of the spray or rendering the spray fluid more liable to injure the sprayed plants, e.g., soap could not be used as a spreader for arsenate of lead.

Recently a number of proprietary spreaders have been placed on the market by reputable firms backed by the claim that they are "compatible with practically every spraying fluid."

Stickers, as their name suggests, are supplementary substances, the addition of which to the spray fluid increases the ability of the toxic substance to adhere to the sprayed surface. Actually, the spreader added to a spray fluid functions also as a sticker.

REWORKING DRONE CITRUS TREES.

In orchards where undesirable types of citrus trees have been cut back for reworking, the final thinning of shoots not required for budding into may be done. Where necessary, the trunks and limbs should be re-whitewashed to continue protection from sunburn. In districts where the growth of new shoots is sufficiently advanced (they should have attained a diameter of some ⅜ inch at the base), and providing that the sap is flowing freely, they may be budded.

When the shoots are ready to receive the bud, a perpendicular cut is made in the bark at or near the base. The cut should be from 1 to 1½ inches in length, and in depth through to the cambium layer. Another cut is then made horizontally across the top of the perpendicular one, so that the two together form a T.

Budwood should be taken only from selected trees which are healthy and vigorous and noted for consistent production of heavy crops of quality fruit. Budwood should be well rounded, mature wood about the thickness of an ordinary lead pencil or slightly less, and not more than one year old. Before the buds are cut from the budstick, the leaves are trimmed off so that a piece of the leaf stalk or petiole is left in each case. By this means the bud can be more easily handled after cutting.

The bud may be cut off the stick either from above or below, but the general practice is to cut from below the bud upwards, commencing about half an inch below and ending about half an inch above. The cut must be made with a sharp, thin-bladed knife, and be just deep enough to remove a very thin layer of wood. In the absence of thorns, the wood may be carefully removed from behind the bud, care being taken not to damage the bud.

The bud is then inserted down and under the bark of the stock by raising the latter with the budding knife. In order to bring the bud and stock in close contact, they are bound tightly together with a raffia tie. In from two to three weeks the bud, if it remains green, will have taken—that is to say, united with the stock. The tie may then be cut and the head shortened back to force the sap into the bud. The stub may be utilised to support the shoot from the bud during its early growth, but when the shoot has made good growth and is strong enough to support itself the stub should be removed altogether.

—*R. L. Prest.*

LETTUCE GROWING.

Lettuce is one of the most popular vegetables, and with regular sowing and care in cultivation it may be grown the whole year round. In Queensland, the best times for planting are the late summer, autumn, and winter.

Lettuce is a vegetable that must be grown quickly to ensure crisp leaves. If a check is received during growth the leaves acquire a slightly bitter taste, which tends to decrease the market value of the plants. This defect is more prevalent during the late spring, early summer, and autumn plantings.

The soil should be well cultivated, and it is desirable that, where possible, large quantities of well-rotted farmyard manure be incorporated with the soil. Should fresh manure be used some time should elapse before planting.

Lettuce may be grown in a seed-bed and transplanted into rows, allowing 12 inches between the plants. The seed may also be sown directly into the row and the plants later thinned out to the required distance.

Sow the seed thinly and cover lightly with fine soil, and then firm the ground gently.

During the growing period the soil around the plants must be kept cultivated, but care must be taken not to allow any soil to get on or into the hearts of the plants. Constant watering is essential, and the soil should never be allowed to dry out. Should the plants appear to be growing slowly an application of liquid manure would be beneficial, or, failing this, a top-dressing of nitrate of soda or sulphate of ammonia at the rate of 1 to 2 cwt. per acre. These fertilizers should be spread lightly over the ground, but under no circumstances on the plants.

Lettuce should be marketed as soon as possible after cutting, as they deteriorate in quality very quickly.

The cabbage type of lettuce is the popular one in Queensland, and should be cut for market as soon as possible after hearting. For home use they may be used earlier.

Popular varieties for planting are—

New York or Neapolitan.—A very large variety, best suited for planting in the cooler months.

Iceberg.—A large, good-hearting variety, with crinkled leaves and pink tips, suitable for planting in warm weather.

A pamphlet on packing of lettuce for market is obtainable free on application to the Department of Agriculture and Stock.

—*C. N. Morgan.*

Varieties of Apples and Pears.

H. St. J. PRATT, Senior Instructor in Fruit Culture.

IF intending planters of fruit trees in the Granite Belt have not already placed their orders for the coming season with reliable nurserymen they should do so without further delay. Early ordering ensures early delivery of the young trees.

As regards varieties to plant, the Granny Smith is likely to be the best commercial apple for many years to come. If reasonably well treated it will give a good crop every year.

Some growers are inclined to think that the market will be overloaded with Granny Smith apples when young trees already planted come into bearing. This is not likely to happen.

The Stanthorpe Granny Smith is equal to if not superior to any grown in the Commonwealth. The keeping qualities are good, and far more should be cool-stored than at present. Stanthorpe apple-growers should try to supply the requirements of their own State with Queensland-grown apples as long as possible by using the available cold-storage facilities.

If the Granny Smith crop in the Stanthorpe district were doubled, or even trebled, there should be no difficulty in marketing the fruit at existing or even enhanced prices.

In addition to the Granny Smith, which should be the main variety, Delicious, Lalla (Red Delicious), Winesap, and Red Statesman are good types.

Red Statesman and, in addition, Dougherty are eminently suitable for the late "private order" trade. Growers who specialise in this trade should cater for their customers over as long a period as is possible. Stocks are frequently exhausted long before they should or need be, and then supplies have to be drawn from elsewhere.

The Gravenstein is a good early dessert apple well worth growing. On account of its susceptibility to gnarl or twist it is advisable to grow a scaffold tree of another strong-growing variety, such as Delicious, and then rework with Gravenstein scions from selected trees free from the trouble.

Growers should be wary of planting new varieties of apples. Generally it is a good plan to plant only standard varieties and let someone else do the experimenting. Though new varieties may have good characteristics, they are seldom better than those already grown, and being unknown to the trade or the householder the fruit is viewed with suspicion and is difficult to market.

As regards pears, the best commercial varieties are Williams Bon Cretien, Packham's Triumph, and Beurre de Box—all are good growers and croppers.

The Winter Cole is a late-maturing variety which is popular in the other States. Stanthorpe growers should, however, limit their plantings of this variety on account of possible fruit-fly attacks at the end of the season.

TRANSPLANTING TOMATOES.

When tomatoes are transplanted during summer, considerable loss is often caused by the young plants "burning off" at ground level. This is particularly noticeable where the soil is fine or sandy.

A dull day should be chosen for transplanting, but if the area is large and transplanting cannot be postponed it should be done late in the day. Roll the stem of each plant in paper just before planting. This is best done by having a sufficient supply of papers cut to a suitable size—for the average size plant, about 4 inches by 1½ inches. The papers may be threaded on a string and suspended from the belt of the field worker for convenience in use. On taking a plant from the carrying-box or basket, the paper is snapped off the string and rolled round the stem of the plant—like rolling a cigarette—leaving only the top leaves and the root exposed. The plant may then be placed in the ground in the usual way. It will be found that after a little practice very little extra time will be required for this method of planting. Other advantages of this method are that the young plant does not readily droop, and soon becomes established. Where cutworms are troublesome, it also will give a good measure of control during the early stages of growth.

—*A. M. Richardson.*

PLANTING THE ORCHARD TREE.

In planting out orchard trees to ensure their being placed exactly in the position indicated by the marking pegs, a planting board will be found very useful, and is easily made. A board about 4 or 5 feet in length, 4 or 5 inches in width, and 1 inch thick, will serve the purpose readily. A "V" notch is cut in one side in the centre, and a similar notch at each end, and the board is ready for use.

The centre V is placed against the peg denoting the position of the tree, and pegs are driven in at the notches at both ends of the board. The board and tree peg are then removed, leaving the two pegs at the ends of the board in position. The hole to receive the tree is then dug. When ready to plant, the board is brought into use again, being fixed as before at the ordinary soil level between the two remaining pegs. The tree is placed in the hole at the centre V in the board, taking the position formerly occupied by the tree peg, and the soil filled in.

The planting board serves another purpose, in that it ensures planting the tree at the proper depth. The correct depth at which to plant the tree is the depth at which it was grown in the nursery; the mark can usually be distinguished on the tree. The union of the stock and scion is always a weak spot in a tree and liable to attack from fungus diseases; it should therefore be kept above the level of the soil. When using the planting board, the union, if kept level or slightly above the top of the board, will ensure the tree not being planted too deeply.

In digging the holes for the trees, the surface soil should be taken out and kept on one side, and the subsoil at the bottom of the holes should be finely broken up. Provided the orchard has been properly prepared, there is no need to dig deep holes; so long as they are large

enough to space the roots without cramping they will serve the purpose. A little top soil may be returned to form a small mound at the bottom of the hole. The roots, which should be carefully washed and trimmed, should be spaced as evenly as possible, and with a downward and outward slope of from 40 to 45 degrees. The spaces are filled with fine soil, and pressed firmly, water being applied and allowed to soak in before the hole is completely refilled with soil. Where there is a danger of the trees being scalded by the sun, they should be protected by cylinders of paper tied around the trunks.

The season for planting is determined by location and local circumstances. Where frosts are likely to occur, July or early August planting is preferable to autumn, but where there is no danger of frost injury autumn planting is satisfactory, as it enables the trees to obtain a root-hold before the winter, thereby materially assisting an early spring growth.

—*R. L. Prest.*

LABELLING THE EXPORT APPLE CASE.

With the export of fruit overseas now in full swing, close attention should be given to details in the general "get up" of fruit-labelling.

It is often found when inspecting fruit at the ship's side that labels have not been carefully pasted to the ends. If these are lost or torn, there is no means of identifying the owner or the trade description of the contents of the case.

Care in applying the labels is therefore necessary. A good paste is made as follows:—

Take 1 lb. flour, ½ oz. alum, and 1 pint water. Mix with a little cold water, then add boiling water until the paste thickens. If the resulting paste is too thin, it should be boiled slowly and a little more flour added with vigorous stirring until the consistency is right.

When applying the labels, they should first be soaked for a short time in clean water. The paste is then applied by using a broad brush first to the case end and then to the label. The pasted surfaces are applied to each other, the label and the case being pressed into close contact by rubbing the surface of the label with a damp rag.

The following points should be observed:—

Place the label squarely on the end of the case.

Use rubber stamps for filling in particulars of varieties, &c. Pencil or writing of any description is not permitted.

Apply the rubber stamp squarely in the spaces on the label.

It must not be forgotten that Queensland's overseas consignments compete with the world's best fruit on the United Kingdom and European markets. Quality fruit should not be handicapped by a faulty finish to the case.

—*Jas. H. Gregory.*

The Fruit Market.

JAS. H. GREGORY, Fruit Packing Instructor.

THE month of March has shown a more profitable tendency on the market by giving increased values for lines of regular fruits. The month closed with the best gift of all—rain. This should definitely consolidate the coming citrus, custard apple, banana, and other crops which had already begun to wilt. Most fruits have shown definite rises in value on all markets, papaws, tomatoes, bananas, and pineapples maintaining firm rates. Apples have not improved to any great extent on the low prices at the start of the season. A rise of from 1s. to 2s. has been noted for good lines. Stanthorpe pears have given trouble frequently. One still finds it hard to understand why growers persist in sending poor packs of fruit to market. Early new season's citrus is now appearing, some excellent grapefruit from Gayndah being noticed. Some of the imported Palestine grapefruit is still in the shops. What a tribute to its keeping quality and packing! The fruit is as good inside as it looks outside—excellent in flavour, thin skin, and full of juice, retailed at 6d. and 8d. a fruit. A comparison of this fruit with that from Gayndah confirmed the opinion that correctly named locally grown Marsh grapefruit was of first quality and capable of competing with both the Palestine and American product on equal terms. If fruit of this quality could be sold to the public more often and at a reasonable price, a much larger market would soon be established.

The following were the ruling market prices during the last week of March, 1938:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish—Nines, 12s. to 16s.; eights, 8s. to 16s. 6d.; sevens, 9s. to 15s.; sixes, 6s. to 14s.

Sydney.—Cavendish—Nines and eights, 15s. to 18s.; sevens, 13s. to 17s.; sixes, 10s. to 13s.

Melbourne.—Cavendish—Nines and eights, 15s. to 16s.; sevens, 13s. to 14s.; sixes, 10s. to 12s.

Lady's Finger—1¾d. to 5d. per dozen.

Pineapples.

Brisbane.—Smoothleaf—3s. 6d. to 6s. 6d. per case, 1s. to 6s. per dozen. Ripley—7s. to 10s. per case, 1s. to 5s. 6d. per dozen.

Sydney.—7s. to 10s.

Melbourne.—7s. to 9s.

Specials higher.

More care in handling is necessary on the part of growers to reduce the incidence of water blister.

Papaws.

Brisbane.—15s. to 18s. per tropical case.

Sydney.—16s. to 20s. per tropical case.

Custard Apples.

Brisbane.—Some early consignments have been marketed, realising to 8s. per case. Growers are urged to only market matured fruit.

Mangoes

The mango season is now finished. Growers of special types have marketed their fruit at very payable prices.

Avocados.

Small lines of this fruit have been marketed. Retailers have not been altogether satisfied with the quality, the fruit being too green. A demand for this fruit can only be developed by the public if matured fruit only is sent to market.

Passion Fruit.—5s. to 8s.; Specials, 10s. to 12s.

Rosellas.—2s. to 2s. 6d. sugar bag.

CITRUS FRUITS.

Oranges.

Brisbane.—Local Navels, 12s. to 15s. per bushel case.

Many lines of oranges have been rejected on the market for immaturity.

Sydney.—Navels, 1s. to 7s. per case.

Mandarins.

Grapefruit.

Brisbane.—Gayndah, 12s. to 15s. per bushel.

Sydney.—6s. to 10s. per bushel.

Melbourne.—15s. to 16s. per bushel.

Lemons.

Brisbane.—Gayndah, 8s. to 15s. per bushel.

Sydney.—15s. to 19s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan—4s. to 7s. Granny Smith—5s. to 7s. Delicious—4s. to 7s. Hail-marked lines lower.

Sydney.—Delicious—9s. to 12s. Granny Smith and Jonathan to 7s.

Pears.

Brisbane.—Williams, 8s. to 11s.; Howells, 6s. to 8s.; B. de Caps, 7s. to 9s.

Quinces.—4s. to 5s. bushel case.

Local stone fruits have now finished. Growers would be well advised to thoroughly cleanse the sheds and packing plant to eliminate possible brown rot infection of the future.

OTHER FRUITS.

Figs.—1s. 6d. to 2s. 6d. tray, 5s. to 6s. dozen boxes.

Grapes.

Brisbane.—Walthams—3s. to 5s. Flame Tokay and Purple Cornichon—4s. to 6s. Muscats—2s. 6d. to 4s.

Tomatoes.

Brisbane.—Ripe, 4s. to 9s.; Green, 3s. to 8s.; Coloured, 5s. to 10s.; Special higher.

Sydney.—Locals to 10s. per case.

MISCELLANEOUS VEGETABLES, &c.

Rockmelons.—Stanthorpe, 5s. to 7s. per bushel.

Cucumbers.—3s. to 5s. per bushel case.

Pumpkins.—4s. to 4s. 6d. per bag.

Marrows.—3s. to 7s. per dozen.

Lettuce.—9d. to 1s. 6d. per dozen.

Cabbages.—6s. to 12s. chaff bag.

Beans.—6s. to 8s. sugar bag.

Peas.—8s. to 10s. per sugar bag.

Chocos.—1s. to 1s. 6d. per dozen.

SOUTHERN FRUITS.

Grand Duke.—4s. to 7s. half bushel.

President.—4s. to 7s. 6d. half bushel.

SUCKERING IN THE BANANA PLANTATION.

A flush growth of young suckers has appeared in most banana areas since the splendid January rains have made growing conditions excellent for bananas generally.

Before they form their own root system, these suckers rely solely on the parent plant for their subsistence, and where a number are present they retard the parent plant's growth and the development of its bunch of fruit.

Most growers have a definite time for suckering in their working plan, but others fit in at any time, if at all, with the result that four, six, eight, and up to a dozen suckers, ranging in size from "peepers" to fully-grown plants, are seen, *all* of which have robbed the parent plant of some of its vigour.

Even in the most fertile soils the number of suckers left to bear the grower's next bunch should seldom be more than two, and sometimes three. It is desirable, therefore—particularly if a fertilizing programme is carried out—to destroy *all* the suckers which are not required as soon as they peep above the ground. At this stage they are easy to disconnect with little damage to the plant, and the fertilizer applied goes *only* to those suckers which will eventually produce the next cutting of bananas.

—*J. R. Horsley.*

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, the Jersey Cattle Society, and the Friesian Cattle Society, production charts for which were compiled during the month of February, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
AUSTRALIAN ILLAWARRA SHORTHORNS.				
MATURE COW (OVER 5 YEARS), STANDARD 350 LB.				
Eveline of Alfa Vale	W. H. Thompson, Manumbar road, Nanango	14,334·15	694·216	Reward of Fairfield
Rhodesview Kitty 7th	W. Gierke and Sons, Helidon	12,212·42	515·154	Blacklands Prospector
SENIOR, 4 YEARS (STANDARD 330 LB.)				
Cedar Grove Elma 32nd	W. H. Sanderson, Mulgeldie	10,294·4	337·31	Duke of Cedar Grove
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Glenhead Lady Jean	W. H. Sanderson, Mulgeldie	8,156·4	302·792	Greenfields Lord Clare
JUNIOR, 2 YEARS (STANDARD 230 LB.)				
Rhodesview Fanny 28th	W. Gierke and Sons, Helidon	10,777·75	416·819	Blacklands Prospector
Jamberoo Rosie III.	N. Bidstrup, Warra	6,866·29	258·716	Banker of Brooklyn
JERSEY.				
JUNIOR, 3 YEARS (STANDARD 270 LB.)				
Kathleigh Comic	F. W. Kath, Malakoff, Dalby	6,710·41	383·079	Retford King's Thorn
SENIOR, 2 YEARS (STANDARD 250 LB.)				
Bremerside Gem	W. Bishop, Kenmore	5,992·15	307·163	Carnation Victory
FRIESIAN.				
MATURE COW (STANDARD 350 LB.)				
Towerlton Anona	F. C. Noller, Kumbia	10,645·55	386·915	Domino Belted King

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Grasses from Injune Named.

N.L.R. (Injune)—

1. *Trichinium macrocephalum*, a native plant of the Amaranth family (*Amarantaceae*). It is fairly common on the Darling Downs and throughout much of the West. We have a number of species in Queensland and most of them are regarded as good fodders. "Fluffy top" is a name frequently given to them.
2. *Aristida armata*, one of the wire grasses or three prong spear grasses. The three prong spear grasses, on the whole, are of very little value as fodder, except when very young. They are sometimes eaten by stock, particularly steers, in the absence of other feed.
3. *Cyperus bifax*, a sedge not a true grass. The differences between sedges, grasses, rushes, etc., are given in "Botany for Queensland Farmers," published recently by the Department of Agriculture and Stock.
4. *Aristida latifolia*, one of the wire grasses, or three prong spear grasses. See notes under number 2.
5. Blue grass, *Dichanthium sericeum*, one of the best and most platable of the native grasses. It is not usually regarded, however, as very drought-resistant.
6. *Sporobolus pallidus*, one of several grasses with a strong seed-head and very small spikelets, known in Queensland as "fairy grass." It comes up very quickly after summer rains and provides a bite while it lasts, but soon dies away.
7. Small burr grass, *Tragus racemosus*, a very common grass throughout Western Queensland. It provides a bottom bite for sheep, but the burrs are troublesome in wool.
8. Roley-poley grass, *Digitaria divaricatissima*. It is generally regarded as a good fodder.
9. Paddock love grass, *Eragrostis sp. off. leptostachya*. The love grasses, although not particularly valuable in themselves supply quite an important part of the mixed native pasture.
10. Windmill grass, *Chloris ventricosa*, a valuable fodder, particularly for sheep. It is a very common constituent of the cleared brigalow country.
11. Early spring grass, *Eriochloa sp.*, a very valuable fodder, but not particularly drought-resistant.
12. Kangaroo grass, *Themeda australis*, one of the most widely spread of all native grasses. It varies somewhat in regard to its fodder value in different localities. On the whole, its reputation is high but it soon disperses when heavily grazed.
13. Button grass, *dactyloctenium radulans*, a valuable fodder particularly for sheep. Like Flinders grass, it is eaten readily by stock in the dried state and is said to be nutritious.
14. Flinders grass, *Iseilema membranacea*, one of the most valuable grasses we possess, although it has rather a mixed reputation. Stock will eat it either green or dried. In the dried state, it is generally regarded as more nutritious than most grasses, probably because much of the seed is retained and scattered more or less over the whole plant.

"North Queensland Millet."

D. (Clermont)—

The specimen is *Echinochloa Turneriana*, sometimes known as the North Queensland millet. It is a native grass spread fairly widely in the North West and Central West. It is an excellent fodder and is allied very closely to such well-known cultivation plants as Japanese millet and white panicum. It generally grows in rather damp situations, or where the ground has been disturbed. It is not a constituent of the ordinary pasture.

Candle Nut.

F.N.K. (El Arish, N.Q.)—

The specimen is the candle nut, *Aleurites moluccana*, a native of North Queensland, but also spread widely throughout the islands of the West Pacific and Malayan Archipelago. The seeds are full of an oil. They are frequently eaten by people with no ill effects following, but at other times cause violet purging and sometimes vomiting. We think that there is no doubt that these nuts caused the scouring in the horses.

Starr Burr.

"Inquirer" (Esk)—

The specimen forwarded is *Acanthospermum hispidum*, star burr, a native of tropical America, now a naturalised weed in many tropical countries. It is an extremely bad weed in many parts of North Queensland and in some districts, particularly in parts of the Gulf country, is looked upon as the worst weed pest. The plant has established itself in some localities in Southern Queensland, but has not spread to the same extent as it has in the north. It seems, however, to be largely on the increase.

Grasses from Cooyar Named.

G.R. (Cooyar)—

1. A love grass, *Eragrostis elongata*. The love grasses are generally looked upon as only of secondary value. They are, however, quite important constituents of a mixed native pasture.
2. Crown top, *Eulalia fulva*. This grass varies in quality according to the districts in which it grows. Most of those on the Darling Downs and the more southern parts of the State are generally regarded as excellent fodder. In the more northern districts, it seems to grow very coarse and is rather unpalatable.
3. Weeping love grass, *Eragrostis parviflora*, a very common grass in many parts particularly in low-lying country.
4. Early spring grass, *Eriochloa sp.* The name "early spring" is not very appropriate as the Eriochloa grasses are no earlier than many others. They are very palatable and are valuable components of the mixed pasture.
5. Forest blue grass, *Bothriochloa intermedia*, one of the commonest grasses in many parts of Queensland. It is generally regarded as quite a good fodder.
6. Crowfoot grass, *Eleusine indica*. This grass is very widely spread over the warm temperate regions of the world. In Queensland it grows mostly as a weed of cultivation or where the ground has been disturbed. It is not usually a constituent of the ordinary pasture. It is generally regarded as quite good fodder, but like young sorghum contains a prussic acid yielding glucoside. Very little trouble with it, however, is experienced in Queensland.
7. Blue grass, *Dichanthium sericeum*. One of the most palatable and nutritious of native grasses, but not particularly drought resistant.
8. Kangaroo grass, *Themeda australis*, one of the most widely distributed of native grasses. It varies considerably in its fodder value, but on the whole is generally regarded as excellent forage. It does not stand up well to heavy grazing.
9. Windmill grass, *Chloris ventricosa*. The native chloris grasses are valuable fodders, particularly for sheep. The present species is a very common one on cleared brigalow country, but is found in a variety of situations.

Milky Cotton Bush.

J.G.S. (Winton)—

The specimen is not a lantana, but *Asclepias curassavica*, the milky cotton bush or red head, also sometimes known as wallflower cotton bush and wild oleander. It is a native of tropical America, but is now naturalised as a weed in most tropical and sub-tropical countries. It is very common as a weed in coastal Queensland, particularly along creek banks. Usually it is left untouched by stock, but occasionally trouble has been experienced from it. Feeding tests recently conducted at Yeerongpilly proved the plant to be poisonous to animals.

Prickly Poppy.

V.Q. (Tolga)—

The specimen forwarded with your letter of the 2nd instant is *Argemone mexicana*, the prickly poppy, also known as the silver thistle, Californian thistle, &c. It is a native of tropical America, but is now widely spread throughout most tropical and sub-tropical countries. It is very common in parts of Queensland, particularly on river flats on the Darling Downs and the south-east generally. It is a very noxious weed once it gets a hold. It has been accused of poisoning stock, but our only trouble has been where the plants have been cut, allowed to wilt, and the subsequent softened plants eaten by poddy calves. In addition to its prickly nature, the plant contains an extremely bitter yellow sap which makes it quite unpalatable to animals.

A Species of Zamia.

C.E.E. (Warwick)—

The specimen is *Macrozamia Paulo-Gulielmi*, a species of zamia or burrawang with a rather peculiar distribution in Queensland. It is very common in the sandy tracts in parts of the Wide Bay district, particularly about Tinana Creek. It misses a good deal of country and then becomes quite common again in parts of the western Darling Downs, particularly in the Inglewood district. Feeding tests, so far as we know, have not been carried out with this particular species, but it is allied very closely to *Macrozamia spiralis*, a species on which feeding tests have been carried out in New South Wales. All parts of this plant, we believe, are poisonous, and the seeds especially so. Feeding tests with *Macrozamia* seeds at the Veterinary Research Station, Glenfield, New South Wales, showed that 4-8 oz. was a lethal dose of seeds for a sheep, and approximately 2 lb. for a yearling beast. For the lesions produced, the report states that the toxin is a specific protoplasmic poison having a selective action on endothelial cells.

The Quondong.

"Inquirer" (Southport)—

We cannot offer any satisfactory reason for the quondong trees not bearing fruit. Many native trees are very erratic in the amount of fruit they bear. For instance, in the case of the *Macadamia* nut some trees will bear heavy crops of fruit, while others alongside are quite shy bearers. In the case of the quondong, it is not a question of male and female trees as the flowers are hermaphrodite. The quondong tree is parasitic on other trees, the roots deriving their water supply and plant foods in general from other trees in the neighbourhood. We hardly think, however, the nature of the host tree would have any effect on the fruiting qualities of the quondong.

Rain Forests.

L.B. (Project Club, State School, Lowmead)—

The rain forests, as their name indicates, occur within the heavier rainfall regions of Queensland. Rain forests of an increasingly drier type—the trees smaller and the undergrowth less and of a generally drier type—occur in areas with the rainfall down to 35 inches per annum.

A rain forest is a purely coastal type and occurs rarely more than 100 miles inland. One example of a rain forest being situated at a greater distance from the coast is that of the Bunya Mountains.

The wetter rain forests have developed in:—

The extreme south-eastern portion of the State, including the Macpherson Range and Tambourine Mountain. The near coastal districts between Landsborough and Cooran. The small area round Yeppoon. The area between Mackay and Proserpine. The fairly large area to the north, south, and west of Cairns. The northern part of Cape York Peninsula.

The drier forms of rain forests referred to occur in such places as the Fassifern district, Lockyer Range, and around Rockhampton, &c.

Rain forests are sometimes regarded as being confined to basaltic soils, but this is not so.

Trees and Grass for Caloundra.

R.H. (Caloundra)—

Trees proved to do very well in seaside localities in southern Queensland are:—Pongamia tree (*Pongamia pinnata*); cupania (*Cupania anacardioides*); sand cypress (*Callitris columellaris*); hoop pine (*Araucaria Cunninghamii*); figs (*Ficus* spp.), (*Ficus platypoda*—small-leaved Moreton Bay); and cotton tree (*Hibiscus tiliaceus*).

We are rather doubtful if plants of all of them can be obtained through the ordinary commercial channels, but most of them may, perhaps, be obtained from the Brisbane City Council's nurseries, either at the Botanic Gardens or at Hamilton.

As to a suitable grass, we think the best all round grass for your purpose would be the Queensland blue couch (*Digitaria didactyla*). This is always put down by roots, and as it occurs naturally, this is not so tedious and slow as it would at first seem. Bulletin No. 3 issued by the Queensland Branch of Green-keeping Research deals very extensively with the laying down of fairways and putting greens of blue couch.

Northern Plants Named.

C.R.M. (Townsville)—

1. *Andrachne Decaisnei.* This plant is strongly cyanophoric and we think has been the cause at odd times of deaths in sheep, particularly freshly untrucked sheep, on the Hughenden common and other places.
2. Josephinia Burr, *Josephinia Eugeniae*, a very common plant throughout the whole of the central west and north west.
3. *Amarantus paniculatus*, a plant of the Amaranth family (*Amarantaceae*). Plants of this family are generally regarded as quite good fodders for stock.

Plants from Nanango Named.

School Project Club, (Kunioon, via Nanango)—

1. Rhodes grass, *Chloris gayana*, a native of South Africa and one of the most valuable grasses introduced into Queensland.
2. Common couch, *Cynodon dactylon*, a very valuable fodder, nutritious, and relished by all classes of stock. It does not, however, make a very heavy leaf growth.
3. *Paspalidium flavidum*, one of the native Paspalidium grasses. These are generally looked upon as good fodders.
4. Stink grass, *Eragrostis cilianensis.* The local name arises from the fact that this grass possesses a number of glands at the edge of the leaf which give off a not altogether unpleaant odour. It is not generally regarded as a particularly good grass for stock.
5. Weeping love grass, *Eragrostis parviflora*, a very common grass throughout Queensland. It mostly grows in rather low-lying situations or badly-drained country, but is not confined to such places. It is not usually regarded as of much value for stock.
6. Summer grass, *Digitaria marginata.* This grass mostly grows as a weed of cultivation. When it grows in the ordinary pasture it favours rather sandy land. It is generally regarded as a valuable grass for stock.

A Valuable Native Grass.

A.M. (Toowoomba)—

The grass with seedheads is *Brachiaria miliiformis*, a native grass and generally regarded as a valuable fodder. It is also an excellent hay species. This grass is peculiar in that, although a native, it is usually found in places where the ground has been disturbed rather than in the ordinary pasture. It is found quite frequently in old cultivation areas. When found in the ordinary mixed pasture it usually favours sandy land. We cannot determine the other grass in the absence of seedheads.

Swamp Millet.

M.R.M. (Mundubbera)—

The specimen is *Echinochloa Walteri*, sometimes known as swamp millet, an excellent fodder and very closely allied to such well-known cultivated plants as Japanese millet and white panicum. All these at one time were included in the genus *Panicum*, but this large family has now been cut up into several smaller ones, of which *Echinochloa* is one. So far as we have noticed, this grass does not occur away from rather wet situations.

General Notes

Staff Changes and Appointments.

Constable W. F. Aplin, Urandangie, has been appointed also an Inspector under the Slaughtering Act.

Mr. T. E. Dwyer, Police Magistrate, Ayr, has been appointed also chairman of the Inkerman, Invicta, Kalamia, and Pioneer Local Sugar Cane Prices Boards, and an agent of the Central Board for the purpose of making enquiries under Section 5 (2A) of the Regulation of Sugar Cane Prices Acts in respect of sales and leases of assigned lands.

Mr. T. W. Allen, of Allendale, Greenmount, has been appointed an honorary protector under the Fauna Protection Act.

Constable T. Tree, Forsayth, has been appointed also an inspector under the Slaughtering Act.

The following transfers of inspectors of stock, slaughtering, and dairies in the Department of Agriculture and Stock have been approved:—

Mr. D. C. Clifford from Mount Isa to Julia Creek.

Mr. J. W. Moy, from Toowoomba to Mount Isa; and

Mr. N. C. E. Barr, from Brisbane to Toowoomba.

Mr. A. C. Wagner, Kent's Pocket, Boonah, has been appointed an honorary protector under the Fauna Protection Act.

The resignation of Mr. R. J. B. Barton as acting inspector of stock at Habnarey Crossing has been accepted, and Mr. H. H. Griffiths of Yerranbah Station, New Angledool, has been appointed to the vacancy.

Messrs. C. P. Edwards (manager, Abingdon Downs, Georgetown) and J. F. Shaw (Forest Home Station, Georgetown) have been appointed honorary inspectors of stock.

Mr. A. H. Canty, Inspector of Stock, Ingham, Senior Sergeant H. J. McPaul, Sergeant (2nd Class) H. W. Horn, and Constable J. P. Brown (Roma) have been appointed inspectors under the Brands Acts.

Honorary protectors appointed under the Fauna Protection Act include Messrs. G. Hay (Muirlea), J. S. Handley, E. A. R. Lord, J. R. Costello, and M. T. O'Connor (Murphy's Creek), E. E. Franklin (Eagle Heights, Tambourine), and L. V. Wilkinson (Toowong).

Advertising Value.

People have come to depend upon consistently advertised merchandise. They have confidence in the manufacturer who places himself on record month after month as to the merit of his products. They know he will maintain that product at the standard he has set, not only for their protection, but for his own. Should he drop below, the buying public would soon discover it, and his business would be faced by ruin. No manufacturer who is spending large sums to produce, advertise, and sell an article is going to take that risk. Quality, utility, and value are the things uppermost in the mind of the advertiser to-day. Improving his product, making it more useful, giving greater value—these are his aims. When he succeeds, he tells you about it—in the advertisement.

The Plague Grasshoppers Extermination Act.

Regulations have been issued under "*The Plague Grasshoppers Extermination Act of* 1937" which, briefly, deal with the constitution of plague grasshopper destruction committees and outline the powers and duties of members or employees of such committees.

Wild Life Preservation.

An Order in Council has been issued under "*The Fauna Protection Act of 1937*" declaring the area comprised in the reserve for water supply at Herberton to be a sanctuary for native birds and animals.

By Order in Council under the Fauna Protection Act, the city of Cairns has been declared a sanctuary for the protection of fauna.

"Bunchy Top" Quarantine Boundaries.

A Proclamation has been issued under the Diseases in Plants Acts declaring the parish of Mooloolah and portions of the parishes of Bribie and Maroochy to be a quarantine area for the purposes of the Acts on account of the existence of "bunchy top" of bananas. This, in effect, is an extension of the boundaries of the existing quarantine area.

Diseases in Poultry.

An Order in Council has been issued under the Diseases in Poultry Acts declaring certain diseases of poultry—namely, fowl cholera, fowl pest (all varieties), gapes, and stickfast flea—to be notifiable diseases under the Acts.

A Regulation has also received Executive Council approval, and this provides that all male day-old chickens shall be marked with a violet indelible stain by persons licensed under the Diseases in Poultry Acts.

Veterinary Surgeons' Board.

Executive Council approval has been given to the appointment of members of the Veterinary Surgeons Board of Queensland established under the provisions of "*The Veterinary Surgeons Act of* 1936," as follows:—

Professor H. R. Seddon, D.V.Sc., Dean of the Faculty of Veterinary Science, University of Queensland;

Colonel A. H. Cory, V.D., M.R.C.V.S., Chief Inspector of Stock, Department of Agriculture and Stock; Messrs. J. Washington Irving, M.R.C.V.S., Veterinary Surgeon; E. F. E. Sunners, Chairman of the Queensland Meat Industry Board; and Dr. J. Legg, D.V.Sc., M.R.C.V.S., Senior Veterinary Surgeon, Animal Health Station, Yeerongpilly.

Apple Leafhopper Declared a Pest.

A Proclamation has been issued under "*The Diseases in Plants Acts*, 1929 *to* 1937," declaring the Apple Leafhopper (*Typhlocyba froggatti*) to be a pest under such Acts. A Regulation also has been approved providing that the owner or occupier of an orchard in which the Apple Leafhopper is present, must spray his apple trees with an approved spray containing nicotine sulphate of a brand registered under "*The Pest Destroyers Act of* 1923." The first spraying shall be given in the spring as soon as the insect appears on the trees, and a second spraying at an interval not exceeding twenty-one days after the first application. Particular attention must be given to the under sides of the leaves.

Chick-sexing.

Under an amendment to the Diseases in Poultry Acts, it is incumbent upon all persons who engage in the practice of sexing chickens to be licensed by the Minister for Agriculture and Stock. There is no fee for this license, but it is necessary for the person who sets out to determine the sex of chickens to show, by examination, efficiency in the practice.

The amendment further provides that chickens which are determined to be male chickens shall be branded with an approved stain. This branding is to be done by the person licensed to determine the sex.

In future, therefore, purchasers of chickens will know definitely that chickens carrying a distinctive stain, and in which the plumage is not true in colour to the nature of the breed, have been determined as male chickens by a competent person. Consequently, there should be little possibility of unsuspecting individuals buying in ignorance male day-old chickens.

Rural Topics

Pig Raising in North Queensland.

The current report of the North Queensland Co-operative Bacon Association, Ltd., and the Northern Pig Board indicates that good progress has been made in the North. During February of this year no fewer than 800 pigs were received at the Mareeba factory. Most of the pigs were treated by the factory, but some were used to supply the local pork trade.

The supply during March also showed a decided improvement, which is attributed to the steady price being paid for pigs.

It is pointed out in the report that the overseas market for pork products is very firm and that this has a steadying effect on the Australian market.

The present price (March, 1938) for prime grade baconers at the Mareeba factory is 5½d. per lb. dressed weight.

The price of back-fatters at Mareeba factory has been increased from 2¼d. to 2½d. per lb. dressed weight, but the management stress that the back fatters should not be too fat as the northern market will not buy small goods made from very fat pork.

Best Time to Poison Green Timber.

The autumn is the best time to poison green timber with arsenic pentoxide or sodium arsenite. If the job is done when the sap flow in the tree is ceasing, suckering will be reduced to a minimum.

Para Grass May Become a Pest.

While it is a very valuable pasture grass in coastal areas, Para grass (or *Panicum muticum*) is not entirely free of undesirable features. Under certain conditions—such as when growing on very damp land and in drains, &c.—it possesses a tendency to become ineradicable. In the Tweed River (New South Wales) district, where the grass has been grown for many years, serious trouble has been caused by its choking-up of drainage and irrigation channels. So bad has the position become in that district that a suggestion was made recently that some legal restrictions be imposed on the culture of the grass. Farmers and graziers who have areas of Para grass on their properties are advised to keep the grass clear of all streams and channels in which a free flow of water is desired. Further, the grass should not be permitted to encroach on cultivation lands, particularly where the cultivated area is well supplied with soil moisture.—*C. W. Winders.*

Good Work.

A mother wrote recently to the Queensland Committee of the Australian Dairy Produce Board expressing thanks for the assistance and encouragement given her son in his school pasture improvement project club work. This assistance, she said, had enabled her boy to obtain a scholarship for entrance to the Gatton Agricultural College, where he has now entered on his chosen course of study.

Putting Science Into Practice.

Professor A. F. Barker, the well-known wool research worker of Leeds University, who was a recent visitor to Sydney, made a point in the course of an interview that will be appreciated by most farmers and graziers who want to apply the findings of science to the soil and to livestock breeding. "After twenty years of research endeavour," he said, "it is evident that the difficulty lies not in conducting researches, nor obtaining research results, but in carrying this research forward into actual practice in the industry itself." How best to disseminate the knowledge, how to get the results quickly out to the men on the land—that is the problem. The trouble is to get the results of research into ordinary, everyday language. Agricultural and veterinary science workers are, after all, not working for their fellow science workers, but for all engaged in the land industries. "What is wanted are interpreters to explain the results of scientific work in language that we can all understand."

A Good Slogan.

Here is a slogan for the farmer containing a good argument for co-operative marketing:—Remember the banana. As long as it sticks to the bunch it is safe. When it leaves the bunch it may get skinned.

Organising a Clearing Sale.

From time to time, in every district, farm clearing sales are held. Every clearing sale of farm stock and other property should be properly advertised. It is necessary that the greatest number of buyers possible should be assembled for bidding if the sale is to be successful.

Where special breeds of pure-bred livestock are to be sold, it is wise to advertise in the breeders' journals, or have a special catalogue prepared, showing the breeding of every animal to be offered. The catalogues should be distributed well in advance of the sale to all people who are likely to be interested in the purchase of pure-bred stock.

Most sales would be greatly improved, and the returns from the auction increased, if time before the sale were spent in getting everything in the best possible shape for the sale. The farm itself could be improved by seeing that the main entrance gates are in order—first impressions are of the utmost importance to a possible purchaser—and that all the farm work is brought up to date. What is better to look at than a well-ordered and tidy farm? The stock to be offered should be in top condition. Condition on livestock and working horses put pound notes on to the cheque that the seller ultimately receives from the auctioneer. Stock in average condition only bring average—and, very often, below average—prices. Stock dealers who attend sales make their profit from fattening and quick selling of the animals they buy. It would be better for the farmer to get that profit for himself by seeing that his stock is in the best possible condition for the sale. Every allowance must be made, of course, for seasonal circumstances and so forth, but it would be better to postpone a clearing sale than to sell stock much under their value. Well-groomed stock and tidy yards all help the sale, and any extra work or expense beforehand is well repaid by the higher prices received.

If a farmer is selling off everything, the importance of right display of implements and other equipment to be offered comes into the business. All articles should be properly listed and labelled. A good auctioneer will do the rest. What the farmer has to do is make the clearing or dispersal sale a business proposition, use business-like methods, and any extra costs incurred are usually covered many times by the increased returns.

Parsley.

Parsley will grow almost anywhere and on any kind of soil which is not of too stiff a nature, although a partially-shaded position and a rich, moist soil suit it best. Being a biennial, it must be sown each year in order to provide a continuous supply. It should be sown twice a year—in March and April for use in winter and spring, and again in August and September for use in summer. Seeds may be sown in shallow drills in the open ground, and the seedlings thinned out to about 6 inches apart. It frequently happens that parsley is sown too thickly and early thinning is neglected, with the result that the plants run to seed prematurely. Instead of sowing a continuous row, drop a few seeds along the drill at 6-inch intervals, and when the seedlings have developed several leaves remove all but the strongest plant in each group.

Farmers Like to be Shown, Instead of Told.

The aim of the Sunday morning countryman's session—broadcast between 9.10 and 9.30 a.m. every Sunday morning from the National (4QG or 4QR, Brisbane) and Regional radio stations (Queensland)—is to give the farmer information and not *tell* him to do things in his own business. Information and not advice is what the farmer wants—and there is a whole lot of difference between the two. Anybody can give advice about anything, but not everyone can give sound information. No one realises more than the farmer the necessity of working in double harness with the science worker or the agricultural or dairying instructor who is able to show him how to make or save money, for, after all, that is what this question of giving information boils down to.

Tribute of Commerce to Agriculture.

From the United States comes a story of an interesting custom that is spreading over there. Here is an instance:—Last December the Nashville Chamber of Commerce gave special recognition to the farmer within its territory who had rendered the most distinguished service to agriculture in the course of the year. The gathering together of 200 farmers, business and professional men to do honour to a man who had done a great work for primary industry was a notable event. It certainly belied the old misquoted dictum that "a phophet hath no honour in his own country."

Record Rides.

One of the commonest of top-rail topics is that of long-distance riding records. Here is what the well-known Australian writer, Edward S. Sorenson, had to say in a recent *Australasian*, of the endurance of men who have pronged the pigskin and the gallant cuddies that carried them:—

In these mechanised times long journeys on horseback are not much heard of, but in the old days when the horse was king of the roads, long fast rides and great feats of endurance by man and horse were common. In those happy times everybody rode, from children going to school—and in some places the school was a dozen miles away—to the settler's wife going visiting or shopping. Even the splitter and the fencer rode to and from their work in the bush.

It was hard to find a home outside the big towns that did not include saddles among the general furnishings. In most homes there were four—a man's and a woman's saddle, and two small or old ones for the youngsters. If a girl did not possess a horse and saddle of her own, it was the duty of her cavalier to provide them. A favoured Christmas or birthday present was a horse or a saddle, and I have seen many a saddle and lady's bridle among the wedding presents. One popular bride, who married a free selector, got three saddles and seven bridles.

A feature of all country racecourses was the cavalcade of men and women, boys and girls, thundering across from point to point to keep in close view of the racing. They rode long distances to picnics, dances, and other festivities, returning probably in the foggy hours of early morning. They rode to entertainments in town, starting back about midnight for homes that were anything up to twenty miles out.

But what was twenty miles when men rode 300 miles to see the race, and here and there a young fellow rode fifty miles on Sunday morning to see his girl, and fifty miles back on Sunday!

THREE-FIGURE RIDES COMMON.

Many of the long-distance rides that gained wide notice were done on stock horses taken straight off the grass. A hundred miles a day was quite an ordinary feat for stockmen and stock horses. Nor were the men on the cattle runs and the scattered selections the only hard riders.

A one-time commissioner of police in Adelaide, Alexander Tolmer, rode from the Coora police camp to the city, a distance of 120 miles, in one day on a horse he called Bucksfoot. Another good performance was that of a policeman who rode out from the Darling to inquire about two swagmen who had died of thirst on a far western track, and bury them. He left a homestead on the river at 10 o'clock on a summer morning, and was back at 9 o'clock the following evening. The distance covered was 136 miles, with no food or water on the way.

A lad, who was afterwards widely known as "Cockatoo Jack," was once sent from Rosebrook to Cooma (New South Wales) for the doctor—a mission that has accounted for many a great ride in the bush. In this instance the doctor was out, and as the case couldn't wait, the boy rode on to Queanbeyan, seventy-nine miles from Rosebrook. Getting a doctor there, he at once started back with him. Before they had gone many miles the medico's town hack knocked up. He then mounted Jack's grass-fed stock horse, which carried him through to Rosebrook, and completed the full journey of 158 miles in twenty-seven hours.

A man who was known as Big Bowden, of Penola (South Australia), used to ride eighty miles one day and back home the next, and as he and his gear weighed 21 stone it was no light performance for one horse. When the Montebello was wrecked at Kangaroo Island in 1906, a selector's son carried the news to Kingscote, seventy-nine miles away, inside nine hours, on a 13-hands pony. The same pony carried an 11-stone man ninety-seven miles between sunrise and sunset.

A Queensland squatter, A. E. Hanslow, in January, 1898, rode a four-year-old mare from Mount Morris to Boothalla and back in fourteen hours, the distance being 124 miles. Another Queenslander—a drover named Charlie Turner—having to inspect cattle at various places on specified dates, rode from Leigh's Creek (South Australia) to Winton, Queensland, a distance of 800 miles, in fourteen days, with three changes of horses.

In 1885, Frank Howson, a wool-scouring contractor, rode an eight-year-old grey mare from Booligal (New South Wales) to Kilfera station in one day and back the next, a distance of 221 miles. On the two following days he rode her another 100 miles. This mare, which had previously belonged to a shearer, was fond of beer, and she was given a nip on the road whenever the rider had one.

ENDURANCE RECORDS.

The longest continuous journey on horseback that I know of was made by an old prospector named Dave Collins, who rode from Clare (South Australia) through the Northern Territory and into Western Australia, co ering 7,816 miles, much of it over hard, trackless country. I don't know how long the journey took him, but he was eighty years old at the time—1917.

In 1907 a good performance was put up by a twelve-year-old boy named Archie Danvers, of Wellington (New South Wales), when trailing a couple of horses that were making back to their native run, somewhere near Tumut. He left Wellington on a Monday, and overtook the horses on the following Friday. He was mounted on a pony, and in the five days rode 300 miles, passing through Molong, Cowra, Young, Cootamundra, and other places. Part of the time was spent in tracking and making inquiries.

A better ride, considering the tragic circumstances, was that of the fourteen-year-old Sylvester Fraser, the only survivor of the massacre at Hornet Bank, on the Dawson River, in 1857. His brother, Billy Fraser, was in Ipswich with the station teams, and to acquaint him of the tragedy the boy rode from Hornet Bank to the town, a distance of 320 miles, in three days, with two changes of horses. He had been struck on the head with a nulla, and recovered after rolling under the bed, and the first twelve miles to Eurombar was ridden bareback. The return journey was accomplished in the same time, with three changes of horses—totalling 640 miles in six days!

Endurance rides are a common thing in the central parts of Australia, where men and horses have to travel tremendous distances in the performance of their various duties; but only now and again is some feat of those hardy horsemen heard of outside the far lands that hold them.

One of the outstanding journeys was that of Mat O'Connor, who had been over forty years in the Territory, and at various times had been mailman, prospector, teamster, stockman, drover, hunter, and station manager—occupations that kept him always moving. He was a good horseman, hard as nails; and his various pursuits took him over the greater part of the Territory; but at the beginning of 1919 they came to a sudden end.

While working among stock in the lush grass season, when flies were bad, his eyes were infected with cattle blight, and he became totally blind. For six weeks he lay in camp, for the wet made travelling impossible. Then he set out for the railhead on the Katherine, a distance of 350 miles, which was covered in eleven days. A mate led his horse the whole way, while Mat led the packhorse that carried their camp ware and tucker. Most of the country was bad to travel. From the railhead he journeyed to Darwin, thence to Sydney.

The time and distance of his ride to the Katherine are easily dimmed by the feats of scores of bushmen, but they were not riding at the tail-end of a northern wet season, blind, and nearly sixty years of age. In the circumstances, the long dark ride had no parallel in the bush—and it was his last; for Mat O'Connor became an inmate of the old men's home at Parramatta, where he could only dream in his long night of the wide runs he loved.

THE LOST BET.

At one time many a long ride was undertaken for a wager. One that is niched among the immortals was Skillicorn's ride from Bathurst to Sydney, a distance of about 125 miles, which he backed himself to do in less than twenty hours, for £150. That was in September, 1860, when the mountains made stiff climbing. The other party to the wager was a Bathurst publican named Job Manning.

Skillicorn did the trip in nineteen hours fifty minutes, which was considered a good performance on the bad roads of that time. But a man had been posted at a wayside house; he asked Skillicorn to have a drink, then said he would walk along a bit with him. Skillicorn walked about 100 yards before mounting again, and thereby lost the wager, it having been stipulated that he had to ride all the way.

Orchard Notes

MAY.

THE COASTAL DISTRICTS.

SUCCESS in fruitgrowing depends not only on the proper working and management of the orchard, but also on the way in which fruit is handled and marketed. With citrus fruits particularly, none pay better for extra care in packing and presentation.

Some growers do not realise how easily the skin of citrus fruits is injured, especially that of fruit grown under moist and humid conditions.

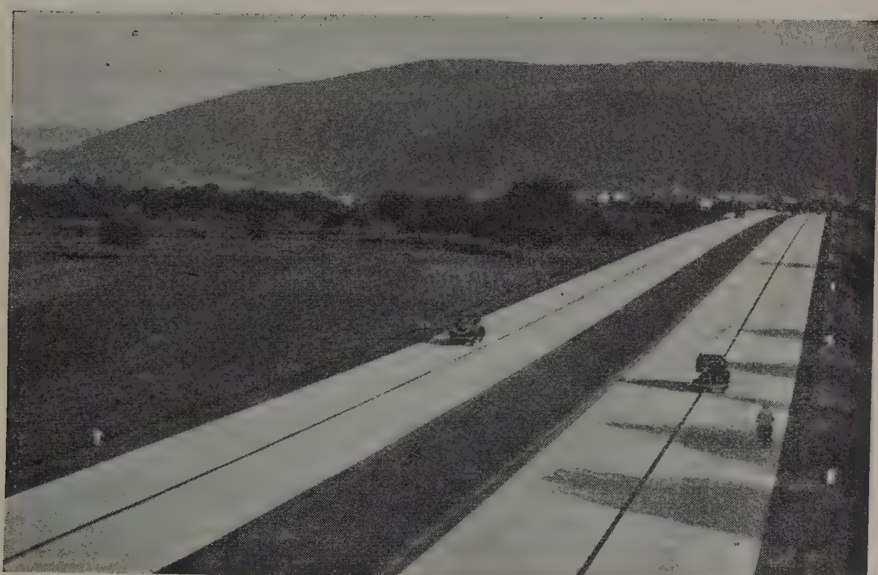
In order to prevent injuring the skin when gathering, all fruit should be cut and not pulled. Any fruit that falls or is injured in any way should be rejected, as it is not fit to send to a distant market. If, however, the injury is only slight, it can be sent to a local market for quick sale.

For oversea and interstate markets only choice fruit should be selected. It should be graded for size, colour, and quality, and properly packed, only one grade of fruit being packed in a case.

All orchards, vineyards, and plantations not thoroughly clean should receive immediate attention.

Banana and pineapple plantations should be put into good order, and kept free from weed growth.

Land to be planted with fruit trees should be got ready, as, if possible, it is always advisable to allow newly-cleared land to ''sweeten'' before planting.



[*Photo: L. Andersen, Dept. Agric. and Stock.*

Plate 148.

Concrete Highways like these high and low speed roads are becoming common in Europe.

Farm Notes

MAY.

FIELD.—Areas already lying in fallow for subsequent sowing with wheat should be kept in good tilth, using field implements that have a stirring effect in preference to those which tend to reverse the surface soil. The surface should never be allowed to cake; consequently all showers should be followed by cultivation, as soon as conditions will permit of teams and implements working freely.

Early fodder crops—such as barley (skinless or Cape) and certain varieties of wheat—may be sown during April.

Potatoes should now be showing good growth and should be kept free from all weed growths by means of the scuffler. If sufficiently advanced, and any doubt exists as to the prevalence of blight, advantage should be taken of fine weather to give a second spraying of Bordeaux mixture, a calm and somewhat cloudy day being chosen, if possible, for the spraying.

Where land had been previously well prepared, lucerne sowing should be carried out this month, and intending growers of this fodder will be well advised to ascertain the germinating qualities of seed submitted to them for purchase. The difference between a good and bad ''strike'' is often traceable to the poor class of seed sown.

Maize and cotton crops should now be in the harvesting stage, and, once matured, are better in the barn than the open paddock, where weevils and other insects are usually prevalent at this season of the year.

Root crops sown last month should now be making fair growth, and during the early period of such should be kept free from weeds, and where necessary thinned out. Sowings of mangels, swedes, field carrots, sugar-beet, and rape may still be made where conditions of moisture will permit.

As the sowing season is close at hand for certain varieties of wheat—i.e., those which require a fairly long period to develop in—every effort should be made to bring the seed-bed into the best possible tilth and to free it from foreign growths of all kinds. The grading of all seed-wheat is strongly recommended, and growers who favour certain varieties should adopt a system of seed selection from prolific strains with a view to the raising of larger quantities of pure typical grain for ultimately sowing in their larger fields.

Pickling of wheat to prevent smut (bunt) is necessary. Germination tests should be carried out prior to commencing seeding operations.

Sorghums which have matured and are not immediately required as green fodder should, wherever possible, be conserved as ensilage to provide for a reserve, to tide over the period when grasses and herbage are dry.

ANNUAL SCHOOL OF INSTRUCTION IN PIG RAISING.

Arrangements are being made for the school of instruction to pig-raisers and dairy farmers, which is held annually at Gatton College.

It is anticipated this year the school will assemble on 14th June and disperse on 30th June, but further details in this regard will be available in our next issue.

These schools of instruction have become very popular and farmers who have attended them speak very highly of the value of the information received and of the pleasant time spent at the College.

This year a special programme has been planned for junior members of the bacon factories and meat export works staffs.

Full particulars may be obtained by writing to the Principal, Queensland Agricultural High School and College, Lawes, or the Under Secretary, Department of Agricultural and Stock, Brisbane.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE CHILD WHO WILL NOT EAT.

There are several reasons why a child will not eat.

The Sick Child.

The child may be sickening for something. Loss of appetite and vomiting may be the first signs of sickness. The power of digestion is reduced during illness, and the refusal of food is Nature's signal that no food is required. The sick child should not be coaxed to eat. Give him as much water flavoured with orange or lemon as he will take.

The Child who Eats between Meals.

Another child will not eat at meal time when he is expected to eat, because he has been eating between meals. It is very disappointing to a mother who has prepared a good, wholesome meal to find it turned down by the child who has been to the pantry and helped himself, or who has visited his neighbour's mango tree in company with his friends. Such behaviour may be overlooked when it happens occasionally, but when eating between meals becomes a habit, and particularly when the food eaten is of the wrong sort, such as sweets, cakes, white bread and jam, the child's health will suffer. For such an emergency have on hand the right kind of food. In some cases it may be advisable to re-arrange the meal hours. A child cannot be expected to go hungry for long. Provide food at meal times appropriate to the season of the year. Less fuel or heat-producing food such as sugar, starch, and fat is required in the hot weather than in the cold.

The Problem Child.

The most difficult child to handle is the child who refuses food prepared by an over-anxious and over-attentive mother. Refusing to eat provides him with an opportunity of defying a mother who is perpetually telling him what to do and what not to do, a mother who in the opinion of the child is always interfering with his liberty. Further, by refusing his food he becomes the centre of attention; in order to encourage him to eat the mother goes to no end of trouble. The child's food becomes the chief topic of conversation in the family until he begins to heave at the very thought of food. If the child happens to be an only child the situation becomes aggravated. In desperation the mother takes him to a doctor. She knows that he is irritable, quarrelsome, and flies into tantrums, and she is afraid lest he goes into a decline. "Will the doctor order him a tonic?" The mother finds it impossible not to be concerned about his refusing food. Poor appetite is so intimately bound up in her mind with ill-health, and particularly with some form of wasting disease. Such a mother means very well, and has gone to a great deal of trouble sometimes in trying to discover the right thing to do. Her over-anxiety has been the big stumbling-block. Her difficulty may be due to the fact that she has never understood herself and therefore is unable to understand or handle her child, but not always so. The handling of this type of child becomes a problem sometimes even in the hands of expert psychologists. The mother of this child requires to be dealt with in the most sympathetic and understanding manner. She is not helped by the doctor trying to make light of her trouble, which is very real and has got her down. If the doctor has gained the confidence of the mother sufficiently to enable him to reassure her and point out that the child's behaviour is in large measure due to her over-anxiety and fear, he may be able to improve things a great deal. In many cases it is not so easy to dispel the over-anxiety and fear of the mother. It appears impossible to her to make it seem a matter of indifference whether her child takes his food or not. Her anxiety has become a habit, and in the mind of the child the association of ideas of mother, anxiety, interference with liberty and food has become firmly rooted. He becomes bored with receiving so much attention if he has any strength of character, and he longs for freedom and independence. If the mother cannot be educated to change her attitude, it may be necessary to send the child away and place him in charge of a person who understands his management and is temperamentally suited to supervise his behaviour. It is much easier for another person than for the mother to begin a new regime. This will give the mother a chance of recovering from the state of nervous tension which may have developed as the result of her efforts. The difficulty may be solved by sending the child to a nursery school or to a kindergarten where he will mix with children about his own age. His sense of boredom becomes relieved in community life, where he discovers new interests; his constructive tendencies find an outlet for their development, and the food problem is already beginning to be solved. The idea of food ceases to retain its importance in the mind of the child and becomes merely one of the many interests of his life.

Let those mothers who have difficult children try out these methods for themselves, even if only for a short time. Many mothers and children have been helped by them.

How Much to Eat.

(*Contributed by the Queensland Nutrition Council.*)

"LIVE to eat!" or "Eat to live!"—which shall it be? As is the case with so many vexed questions, neither extreme is correct. Would you call normal the man who gulps down a few mouthfuls of food placed before him by an insistent wife, with no thought for its delicacy or method of serving? Do you, on the other hand, really envy the man who turns every meal into a feast, rising with disappointment and some difficulty when the last available particle has disappeared, to seek in repose an opportunity for overworked nature to catch up in the eternal competition? Most assuredly you do not envy either of these extreme individuals. "Moderation in all things and all things in moderation" must be one's motto in eating, as in all the necessities and pleasures of life.

The Appetite.

Scientists will tell you that hunger is accompanied by contractions of the muscular stomach wall, and that those contractions are associated with the secretion of adrenalin from one of the ductless glands. This in turn may be due to a falling level of sugar in the blood. The whole mechanism is very complicated, and appetite is not exactly the same as hunger. Every normal person should experience appetite, but only the starved person real hunger.

We all know what appetite is and the normal variations to be expected, though they are difficult to define. Appetite may become abnormal in three ways—(i.) lessened, (ii.) increased, (iii.) perverted. It should be the aim of every person to keep the appetite within normal limits by neither denying nor satiating it. If, in spite of this reasonable behaviour, it persists in being abnormal, there must be a cause, and the cause must be found. The person to do that is your doctor.

The chief causes of lessened appetite are—

Worry.—A very common cause, especially in women, but also in men.

Irregular Eating.—As indulged in by the housewife who "picks" between meals, the school-child spending his pennies on sweets, and the busy man who "just cannot be bothered!"

General Loss of Condition from overwork, lack of exercise, loss of sleep, &c.

Ill-balanced Diet.—A diet which continues to contain a deficiency of some necessary item (especially vitamin B) very often leads to a loss of appetite.

Gastric Abuse.—The continued use of food or drink irritating to the stomach, e.g., chronic over-indulgence in alcohol, will impair the appetite.

Gastric Disease of various kinds affect appetite. If you have any reason to suspect these, your doctor should have the earliest opportunity of finding this out.

General Disease, even a cold, will impair the appetite. In such cases it is not wise to force it too enthusiastically.

The way to correct diminished appetite is not to force unwelcome food in blank defiance of the body's desires, but to set about finding out why the appetite is poor. *One should examine one's eating habits*

candidly and firmly. Only too often the habits are entirely at fault. The importance of doing this early is not merely the restoration of a pleasant bodily function but the prevention of actual digestive disease. Loss of appetite, "indigestion," distaste for food are often friendly warnings that the digestive apparatus is being ill-treated. If they are ignored, actual disease frequently develops. If you have any doubt at all on the matter, particularly if you can honestly find no fault with your eating habits, you should take your worries to your medical man, particularly if you are getting on in life.

Increased Appetite.

A definitely increased appetite occurs in some diseases such as exophthalmic goitre and diabetes. Apart from this, however, a number of people feel that they ought to eat much more than they really need. This is particularly so with sedentary workers at or past middle age. As that indefinite though real period known as "the prime of life" is passed, creature comforts come to appeal more and more; the spartan recklessness of youth dies away, and pleasurable indulgence appears to be more man's desire. Of those comforts eating is one of the foremost. Coupled with this development is often a growing disinclination for active exercise. True, golf, bowls, and other pastimes are designed to supply this exercise, but they are poor substitutes for the spontaneous activity of youth. Thus it is that those who have never been worried by the lack of appetite become a prey to the insidious fault of over-eating in middle-age. For such as these moderation is more than a motto; it is a necessity.

When we advocate moderation or restriction of food for middle-aged people of sedentary habits we do not condone neglect of eating or close our eyes to the undesirability of a poor appetite any more than in earlier life. The moderation which is practised should be an all-round restraint and not the faddist's exclusion of a particular food. Modern science knows no reason why "red" meats should be prohibited while "white" meats should be permitted. Modern science knows no reason why proteins and carbohydrates should be regarded as incompatible and excluded from the privilege of combining in a meal. Modern science *does* realise, however, that most people, and especially those of the earlier generations, eat far too little of such foods as fruit, milk, and vegetables. For that reason we suggest that the restriction of the "over-forty" diet should commence with the other articles of diet, especially those containing a preponderance of the highly-refined foods.

Effects of Over-eating.

Over-indulgence in almost any form (including over-indulgence in work) is one of the predisposing causes of high blood pressure. Over-eating is an important factor in the causation of diabetes, gout, and other kindred disorders. Even if these definite diseases are not developed (because other things than over-eating must be acting), a state of impaired health and decreased efficiency must result. The tendency to drop off to sleep after lunch is sometimes due to this. A certain laxity of mind is normal after a meal, but drowsiness is abnormal. Increasing girth in middle-age is partly due to over-eating, although other factors enter in here, such as the balance of the ductless glands and loss of muscular tone. Digestive disorders are certainly encouraged by eating too much, especially too much of the highly-refined foods.

Slimming.

To reduce weight is a modern fad. For people overweight by reason of obvious over-eating a reduction of food and a consequent reduction of weight is reasonable enough. Apart from this, however, especially in younger people, slimming is a bad and often dangerous practice. People are not all cast in the same mould—thank goodness! There are people who for one reason or another remain slim and are perfectly healthy. For those people to fatten up a change in their make-up or definite over-eating would be necessary. Similarly, there are naturally stout people, and for these to "slim" necessitates a process of starvation. Many are the disasters to be attributed to this bad practice, not the least of which is predisposition to tuberculosis. There is one rule which these people who wish to reduce might bear in mind—the minimum amount of weight for a given diet is gained if the diet is perfectly balanced. A maintenance diet perfectly balanced is the minimum amount of food that can be taken with safety.

Dietary Rules.

1. If your appetite is normal, treasure it and do not abuse it by neglect or by gorging. Avoid conditions which might interfere with your digestion.

2. If your appetite is poor, examine your eating habits carefully and put them right. If the appetite is still poor, consult a medical man.

3. If you are at all worried about your appetite, consult your doctor.

4. If you are past middle age, and engaged in sedentary work, ask yourself frankly if you are eating too much. If so, reduce the quantity a little and see if you feel any better for it.

5. Do not be misled by single-idea enthusiasts. There is no royal road to health; there is only a guiding principle—moderation!

6. It is safer to be over-weight under thirty-five and under-weight over thirty-five.

A SANCTUARY OF BEAUTY.

Perhaps no work of man receives more love and devotion than is bestowed on a garden. Possibly, even, few works of man or woman so fully and intimately express the character of that worker as does a garden.

Among gardeners a few work for harmony and effect, which develops only in the course of years. The imagination envisages what is to be. Experience and a close observation of nature teaches what is possible. Every advantage of slope, of rock or stream is used to achieve the end aimed at. Continuously there is adaptation; often there is readjustment. Restraint always bridles enthusiasm; impulse is taught to keep pace with the rhythm and step of nature. The gardener learns to be servant and companion to that spirit, conscious of Nature's incomparable art in all its versatility, in all its grandeur, its delicacy, its inventiveness and adaptability.

—Dr. J. Luckhoff, in "South African Gardening."

C.J.M.L.

COCKROACH CONTROL.

Cockroaches are nocturnal, hiding during the day in dark corners and crevices, where they congregate in large numbers. In the house, they usually hide near the sink and drainboard, behind the kitchen cabinet, and in similar places. If disturbed when foraging at night, they run rapidly for shelter, and a knowledge of where they conceal themselves is usually the key to their control.

In Queensland, houses are constantly being reinfested by adults crawling and flying in from outside, and no control measures can keep a building continuously free from the pest if reinfestation is possible. Therefore it is first necessary to clean up all outbuildings and burn accumulated rubbish of any kind. All cockroaches found hiding in packages of food and merchandise being brought into the house should be destroyed. They may be killed mechanically or by spraying with a proprietary fly spray. Crack fillers, such as putty or plaster of paris, can be used effectively to close many openings used by cockroaches as avenues of escape to hiding places. This is particularly important if cockroaches are coming in from adjacent apartments, through wall spaces, or along the plumbing fittings.

Sodium fluoride is the best cockroach remedy for use in homes which have already become infested. If the powder is not readily available in pure form, suitable commercial preparations, generally known as insect powders, containing up to 80 per cent. sodium fluoride can be obtained from any grocer. Sodium fluoride is poisonous to man if taken internally in sufficient amounts, and it should be kept out of food and away from children and pets. If used with reasonable care in cockroach control, however, no harm will follow. It may be sprinkled by hand along the back of shelving, draining boards, and other places frequented by the pests. When so placed in the runways the powder adheres to the limbs and is subsequently taken in through the mouth as the insect cleans itself. Sodium fluoride therefore acts as a stomach poison. The powder remains effective indefinitely in dry situations, but in very damp places it may cake and become useless.

Sodium fluoride is best applied with a small duster or bellows and blown into the hiding places. In this way more cockroaches are directly affected, for they die rapidly when the powder is blown directly on them. The application should be made in the evening and the powder left for two or three days. Frequent treatments are usually necessary at intervals of one or two weeks if the pest is to be kept under control.

—*D. O. Atherton, M.Sc., Agr.*

IN THE FARM KITCHEN.

TOMATOES IN THE MENU.

Tomato and Pineapple Salad.

Take the required number of tomatoes (round shape), some tinned crushed pineapple, 2 sticks celery, mayonnaise, lettuce hearts, curled celery for garnish.

Cut a slice from the stem end of the tomatoes, stand on a plate, cut side down to drain, then put in the ice chest to chill. Drain the syrup from the pineapple. Mix with an equal quantity of diced celery, moisten with the mayonnaise. Sprinkle the tomato cups with a little salt and pepper, and refill with the pineapple mixture, piling well above the tomato. Serve on lettuce heart leaves and garnish with curled celery. Chill again before serving.

Tomato Jellies.

Take 2 lb. tomatoes, 1 bay-leaf, 1 tablespoonful vinegar, 1½ tablespoonfuls gelatine, 1 onion, 1 stalk celery, 1 dessertspoonful castor sugar, 1 cupful cooked peas, peppercorns, salt, pepper, and paprika to taste. Lettuce to garnish.

Wash and cook tomatoes with bay-leaf, celery, onion, and about three peppercorns in a covered pan for ten minutes. Rub through a sieve into a basin, then return to the saucepan. Add sugar and seasoning to taste. Stir in gelatine dissolved in three tablespoonfuls hot water, and the vinegar. Divide the green peas between ten small moulds rinsed out with cold water. Fill up with liquid. Serve the jellies when set on a dish lined with lettuce leaves.

Stuffed Tomato salad.

Take 6 tomatoes, 2 tablespoonfuls diced cooked beetroot, 1 tablespoonful capers, salt and paprika, 2 hard-boiled eggs, 1 tablespoonful minced onion, 2 slices boiled tongne, 2 tablespoonfuls green peas, mayonnaise, lettuce to garnish.

First remove a slice from the top of tomatoes, then scoop out the insides carefully. Place upside down in a cool place while you are preparing the filling. Mince the tongue, capers, and one egg. Mix with onion, peas, beetroot, and salt to taste. Pile into tomato cases. Cover with minced hard-boiled egg, then with mayonnaise. Dredge with paprika. Serve with lettuce leaves.

Tomato Rarebit.

Take 1 cupful strained tomatoes, ½ cupful soft breadcrumbs, ½ lb. grated cheese, ¼ teaspoonful salt, ⅛ teaspoonful pepper, 1 teaspoonful minced parsley. Toast.

Place all the ingredients in a saucepan. Cook till smooth, stirring occasionally. Serve at once on hot buttered toast.

Tomato Honey.

Tomatoes, lemon juice, lemon rind, sugar.

To each pound of tomatoes, allow the grated rind of one lemon. Cut the tomatoes in small pieces. Add the rind. Cook till the liquid is nearly all evaporated. Strain through a fine sieve. Return to the pan after measuring with 1 lb. of sugar and juice of 1 lemon for each pint of tomato pulp. Boil rapidly, skimming well, till thick. Pot and seal.

Tomato and Apple Chutney.

Take 6 large tomatoes, 3 cupfuls brown sugar, ¼ cupful mixed spice, 1 green pepper, 6 apples, 1 quart vinegar, 3 teaspoonfuls salt, 1 cupful stoned raisins, 4 small onions.

Skin the tomatoes. Peel and core the apples. Chop the tomatoes, apples, raisins, and green pepper finely. Add remainder of ingredients, tying the spice in a muslin bag. Boil for one and a half hours. Remove the spice bag. Turn the pickle into sterilised jars and seal.

Tomato Jam.

Take 8 lb. tomatoes, 6 lemons, 7 lb sugar.

Cut the fruit into slices, peel the lemons as thin as possible, and cut the peel into shreds. Squeeze the juice, and add, with the sugar, to the tomatoes. Boil all together till sufficiently thick. Green tomatoes may be used, and oranges substituted for the lemons, using an orange to every pound of tomatoes. Pot in the usual way and store in a dry place.

Tomato Wiggle.

Take 2 eggs, 2 tomatoes, ¼ cupful breadcrumbs, ¼ lb. grated cheese, 2 oz. butter, pepper, and salt.

Drop the tomatoes into boiling water and skin them. Whisk the eggs, chop the tomatoes, and mix with breadcrumbs and cheese, season rather highly. Leave in a basin till required, then melt a knob of butter (or margarine) in a saucepan, and stir "wiggle" over the gas till nearly set. Serve on toast for breakfast.

Tomato Pudding.

Take 1 lb. tomatoes, ½ lb fine breadcrumbs, 1 large onion, a few mashed potatoes, 1 egg, chopped parsley, seasoning to taste.

Skin the tomatoes by dropping them into boiling water, then mash them with the breadcrumbs, finely-chopped onion, a little chopped parsley, a few mashed potatoes, pepper and salt, and the well-beaten egg. Mix the ingredients together. Well grease a pie-dish and bake in a moderate oven for one hour. A little good gravy may be added if not moist enough.

Tomato Chutney.

Take 4 lb. tomatoes, 1 large onion, 1 lb. brown sugar, 2 tablespoonfuls mustard, 2 tablespoonfuls salt, 2 tablespoonfuls pickling spice and peppercorns.

Peel and slice the tomatoes and onion and sprinkle with salt. Leave overnight. Heat vinegar, sugar, and mustard, tie spices in a muslin bag, and add with tomatoes and onion. Simmer for half to three-quarters of an hour. Bottle until required.

Green Tomato Chutney.

Take 2½ lb. green tomatoes, 6 eschalots, 1 lb. stoned raisins, 1 oz. mustard seed, 2 lb. green apples, ½ head garlic, ½ lb. brown sugar, ½ lb. dates, 1 quart good vinegar, salt, and cayenne to taste.

Put the finely-sliced tomatoes, peeled and finely-chopped apples, sugar, and mustard seed, &c., into a saucepan. Add the seasonings. Pour over the vinegar and boil to a pulp. Turn into dry jars and seal down.

Scalloped Tomatoes.

Take 6 tomatoes, 1 cupful breadcrumbs, 2 tablespoonfuls margarine or butter, salt, and pepper.

Scald and skin the tomatoes. Place a layer at the bottom of a well-greased fireproof baking dish. Cover with a layer of breadcrumbs. Season to taste with salt and pepper. Dab with margarine. Continue the layers till the dish is full and the last layer is breadcrumbs. Sprinkle with salt and pepper. Dab with margarine. Bake in a moderate oven for one hour.

HANDY LIFT GATE.

The lift gate illustrated has the great advantage of dispensing with balancing weights. The gates are made of 3-inch by 1-inch timber throughout, 10 feet long,

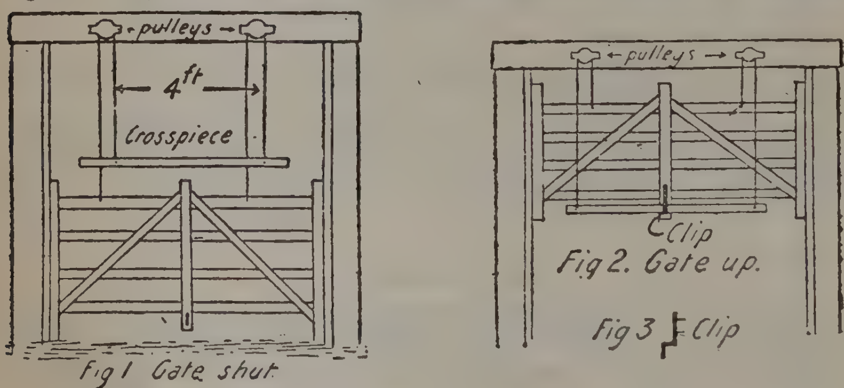


Plate 149.

the battens being spaced 6 inches apart, the bottom batten 7 inches from the ground and the top bar 3 feet from the ground. The pulleys are ordinary cast pulleys, fastened with four screws, costing only a shilling or two each. They are placed 4 feet apart. The fillets between which the gates run are 2 inches by 1½ inches. The iron clip (Fig. 3) is made of 1¼-inch by ¼-inch flat iron of the shape shown, and is bolted on to middle stay of gate. The crosspiece which goes under the clip and holds the gate up is 5 feet long by 2-inch by 2-inch pine. The clip has sufficient turn to take a crosspiece of this thickness.—*New Zealand Farmers' Weekly.*

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF FEBRUARY, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Feb.	No. of years' records.	Feb., 1938.	Feb., 1937.
North Coast.	In.		In.	In.
Atherton	10·69	37	16·68	12·17
Cairns	15·75	56	14·91	4·90
Cardwell	17·00	66	12·23	6·63
Cooktown ..	13·72	62	13·36	9·24
Herberton ..	7·98	52	15·28	9·64
Ingham	16·21	46	28 83	6·32
Innisfail	22·65	57	28·99	7·30
Mossman Mill ..	18·47	25	20·90	20·64
Townsville ..	11·16	67	15·35	4·70
Central Coast.				
Ayr	9·13	51	12·87	5·24
Bowen	8·74	67	9·94	5·76
Charters Towers ..	4·45	56	5·84	3·82
Mackay	11·78	67	12·86	15·38
Proserpine ..	12·50	35	12·18	6·08
St. Lawrence ..	7·77	67	2·01	9·55
South Coast.				
Biggenden ..	4·37	39	0·54	3·17
Bundaberg ..	6·53	55	0·72	6·06
Brisbane	6·33	86	5·62	5·25
Caboolture ..	7·77	51	3·80	6·53
Childers	6·69	43	2·13	4·72
Crohamhurst ..	12·81	45	2·27	9·37
Esk	5·42	51	1·48	2·15
Gayndah	4·21	67	1·34	1·77
Gympie	6·79	68	1·76	6·49
Kilkivan	4·91	59	0·05	4·09
Maryborough ..	6·81	67	1·86	6·59
Nambour	9·70	42	4·22	7·82
Nanango	4·04	56	0·68	1·72
Rockhampton ..	7·75	67	0·46	10·63
Woodford ..	8·43	51	1·13	7·48
Central Highlands.	In.		In.	In.
Clermont ..	4·18	67	4·88	3·58
Gindie	2·75	39	0·10	4·60
Springsure ..	3·84	69	0·24	4·33
Darling Downs.				
Dalby	2·80	68	0·32	1·04
Emu Vale ..	2·53	42	1·69	2·32
Hermitage ..	2·37	32	0·40	0·61
Jimbour ..	2·60	50	..	1·33
Miles	2·69	53	0·01	3·08
Stanthorpe ..	3·14	65	1·86	2·36
Toowoomba ..	4·51	66	1·80	2·96
Warwick ..	3·02	73	2·12	0·89
Maranoa.				
Roma	2·91	64	0·65	3·75
State Farms, &c.				
Bungeworgorai ..	2·24	24	0·80	3·43
Gatton College ..	3·50	39	0·83	..
Kairi	..	..	..	..
Mackay Sugar Experiment Station	11·20	41	11·56	22·77

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—FEBRUARY, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature. Means. Max.	Means. Min.	Extremes. Max.	Date.	Min.	Date.	Rainfall. Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·70	88	75	93	24, 25	68	24, 25, 26, 28	1,336	17
Herberton	..	80	65	89	4	52	27	1,528	18
Rockhampton	29·76	96	75	105	23,24,25	70	19	46	3
Brisbane	29·81	87	71	97	26	63	19	562	7
Darling Downs.									
Dalby	29·80	92	65	104	12	54	6, 27	32	5
Stanthorpe	..	83	58	99	12	44	27, 28	186	6
Toowoomba	..	85	62	98	13	54	27	180	6
Mid-Interior.									
Georgetown	29·74	90	72	96	7, 11, 12	59	27	619	12
Longreach	29·74	94	73	106	12	62	26	400	8
Mitchell	29·77	92	66	102	12	53	27, 28	202	4
Western.									
Burketown	29·71	89	75	96	7	65	23	797	9
Boulia	29·75	93	72	109	2	57	6, 7	275	7
Thargomindah	29·70	97	72	111	12	61	5	32	3

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	April. 1938.		May. 1938.		MOONRISE. April. 1938.	MOONRISE. May. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·2	5·50	6·18	5·20	6·8	7·3
2	6·3	5·49	6·18	5·19	7·11	8·8
3	6·3	5·48	6·19	5·18	8·13	9·13
4	6·4	5·46	6·20	5·17	9·18	10·11
5	6·4	5·45	6·20	5·17	10·22	11·3
6	6·5	5·44	6 21	5 16	11·22	11·50
					p.m.	
7	6·5	5·43	6·21	5·15	12·18	12·34
8	6·6	5·42	6·22	5·14	1·7	1·13
9	6·6	5·41	6·22	5·14	1·51	1·51
10	6·7	5·40	6·23	5·13	2·33	2·29
11	6·7	5·39	6·24	5·12	3·13	3·14
12	6·8	5·38	6·24	5·11	3·51	3·43
13	6 8	5·37	6·25	5·11	4·26	4·22
14	6·9	5·36	6·26	5·10	5·4	5·3
15	6·9	5·35	6·26	5·10	5·44	5·48
16	6·10	5·34	6·27	5·9	6·25	6·35
17	6·10	5·34	6·27	5·9	7·8	7·25
18	6·11	5·33	6·28	5·8	7·53	8·18
19	6·11	5·32	6·29	5·8	8·41	9·10
20	6·12	5 31	6·29	5·7	9·32	10·1
21	6·12	5·30	6·30	5·7	10·24	10·53
22	6·13	5·29	6·31	5·6	11·15	11·47
23	6·13	5·28	6·31	5·6	..	..
					a.m.	a.m.
24	6·14	5·26	6·32	5·5	12·9	12.42
25	6·14	5·25	6·32	5·5	1·5	1·37
26	6·15	5·24	6·33	5·4	1·59	2·36
27	6·15	5·24	6·34	5·4	2·55	3·37
28	6·16	5·23	6·34	5·3	3·53	4·41
29	6·16	5·22	6·35	5·3	4·53	5·56
30	6·17	5·21	6·35	5·2	5·57	6·54
31			6·36	5·2		7·56

Phases of the Moon, Occultations, &c.

1st April	● New Moon	4 52 a.m.
8th ,,	☽ First Quarter	1 10 a.m.
15th ,,	○ Full Moon	4 21 a.m.
23rd ,,	☾ Last Quarter	5 14 a.m.
30th ,,	● New Moon	3 28 p.m.

On the 15th Venus will indicate the invisible planet Uranus. They will apparently be so near each other that even with some magnifying power they might be seen as one object. Both Uranus and Neptune are of little interest to ordinary observers; yet the story of their discovery will for all time be an outstanding event in the history of astronomy. Uranus, in fact, was the first planet that was ever "discovered"; the other wandering stars, known for ages before, were simply "there," and no stargazer was ever mentioned as having seen a planet for the first time. Even more remarkable than the discovery of Uranus by Sir William Herschel was the discovery of Neptune by Adams and Leverrier, simultaneously, not by observation but by intricate calculations at their study table.

Mercury rises at 7.28 a.m., 1 hr. 26 min. after the Sun, and sets at 6.38 p.m., 48 min. after it, on the 1st; on the 15th it rises at 6.59 a.m., 50 min. after the Sun, and sets at 5.59 p.m., 24 min. after it.

Venus rises at 7.4 a.m., 1 hr. 2 min. after the Sun, and sets at 6.42 p.m., 52 min. after it, on the 1st; on the 15th it rises at 7.28 a.m., 1 hr. 18 min. after the Sun, and sets at 6.30 p.m., 56 min. after it.

Mars rises at 8.35 a.m. and sets at 7.31 pm. on the 1st; on the 15th it rises at 8.26 a.m. and sets at 7.10 p.m.

Jupiter rises at 2.25 a.m. and sets at 3.35 p.m. on the 1st; on the 15th it rises at 1.40 a.m. and sets at 2.50 p.m.

Saturn rises at 5.51 a.m. and sets at 5.51 p.m. on the 1st; on the 15th it rises at 5.3 a.m. and sets at 5.1 p.m.

The evening sky is still very luminous with the fine northern and southern constellations. It will now be interesting to watch the various positions of the two great constellations, Centaurus and Argo Navis, as they swing with the Southern Cross around the South Celestial Pole. Regulus, in Leo, is due north of the zenith about 9.30, and Virgo, with Spica, is well above the horizon in the north-east. Then the great Orion sets in the west, while the beautiful curves of the Scorpion arise in the east.

7th May	☽ First Quarter	7 24 a.m.
14th ,,	○ Full Moon	6 39 p.m.
22nd ,,	☾ Last Quarter	10 36 p.m.
29th ,,	● New Moon	11 59 p.m.

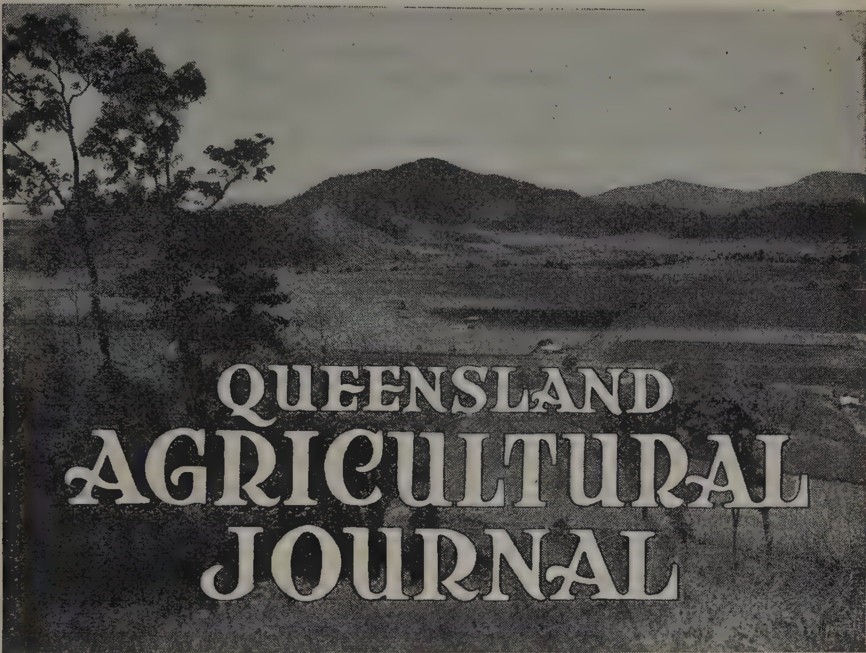
Perigee, 2nd March, at 11.0 p.m.
Apogee, 18th March, at 7.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. XLIX. 1 MAY, 1938. Part 5

Event and Comment

Anzac.

ON 25th April, the 23rd anniversary of the landing on Gallipoli of the Anzac troops—the Australian and New Zealand Army Corps—the young men of our race, who on that day and after offered their great gift of youth and life in the cause of human liberty, were remembered with pride and reverence. They were the men whom John Masefield, the Poet Laureate of England, described as of "the flower of this world's manhood, who died as they had lived, owning no man as master on this earth." In the commemoration was seen something of the nature of the structure underlying the British traditions which inspire so many memorable anniversaries. In it was felt, too, that the spirit of the Old A.I.F. lives on, and that the army of our dead also continues to live in glowing memory.

The Work of William Farrer.

LAST month was commemorated the anniversary of one of Australia's greatest benefactors—William James Farrer, a man of vision who had seen and assessed the opportunities of placing Australia among the great graingrowing countries of the world. It is impossible to place a

money value on Farrer's work, but it can be said that it has resulted in the establishment and extension of an industry worth many millions of pounds to the Commonwealth every year. Farrer sought no personal glory and no pecuniary reward. He thought only of the welfare of Australia and of the wheat industry. On receiving news of his mention for a high honour, he said: "I want only to feel, when the end comes, that my life has not been wasted." This unassuming agricultural scientist was famous throughout the world as a wheat breeder. One of the varieties he evolved—Federation—brought vast riches to Australia, while other drought and rust resisting types bred by him enabled wheat to be grown in districts which had been regarded previously as land unfit for extensive farming. Of his work it may be said that it changed Australia from a wheat-importing to a wheat-exporting country. As a result of it, many thousands of acres of pastoral land have been brought into cultivation, while hundreds of towns and villages have taken their impetus from fields of Farrer wheat.

The third oration in memory of Farrer was delivered by Dr. W. L. Whitehouse, Acting Dean of the Faculty of Agriculture, University of Sydney, and the first of the Farrer Research scholars. After discoursing eloquently on the life and work of Farrer, he said: "Great as the economic value is of Farrer's devoted and painstaking work, we owe far more to him for pioneering this great field of service and for the inspiration he has given us to carry the work forward. For we still have very serious problems facing us in our wheat industry. In some ways, I think they are even bigger problems than Farrer himself had to confront. The world has moved on rapidly since his day. Competition is keener. World demands have changed in many respects. Whilst Farrer bridged a great gap with his wheats, to now go further forward and make striking improvements is not easy."

On a modest three acres of experimental plots at Lambrigg, near Queanbeyan, New South Wales, the seeds of Australia's wealth in grain were sown by William Farrer. "My sole ambition," he told his first laboratory assistant, George Norris, "is to give to the poor man a loaf of bread containing twice the nutriment of the present loaf." His grave where he was buried on 17th April, 1906, overlooks the fields in which he toiled without reward and without esteem or honour to breed the plants that have made Australian grain a factor in the markets of the world.

Allocation of Production in the Sugar Industry.

AFTER having considered the Government Statistician's report on the equalisation scheme which was an outcome of the conference on control of production in the sugar industry in March last, the Premier, Hon. W. Forgan Smith, LL.D., has announced that the small majority in favour of the scheme did not justify substituting it for the existing plan. The Premier said that the Government had been reluctant to continue a scheme which apparently now is only favoured

by approximately half the industry, but felt bound to honour the Commonwealth Sugar Agreement recommended by the industry for acceptance.

The Cabinet was willing to consider sympathetically any other plan devised by the cane growers' and millers' organisations, as provided in clause 10 of that agreement, and in all the circumstances thought it not only necessary in the industry's own interests, but quite within the ability of those bodies, to effect a compromise.

Communications had been received from certain areas seeking some concession in railage charges as a set-off to lighterage charges allowed under the proposal.

A review of the various schemes showed that, while there were divergent views on principle, the actual monetary differences—especially when actual cane prices and returns were considered—were not so great as to prevent sugar executives compromising on some scheme with a majority sufficient to justify sympathetic consideration by the Government.

It was necessary to finalise this matter for the 1938 season, as arrangements for accepting delivery for paying for the sugar output depended upon the issue of the proclamation. This important matter could not await further discussions or tribunals, and the Government had decided to accept the recommendation of the industry regarding Inkerman mill peak, which was carried by 59 to 4, and had issued instructions that the proclamation, with this exception, should be issued on the lines of that of the previous season.

Peak year quotas were discussed at the conference of sugar interests in Brisbane in March. It was decided to adopt the equalisation scheme formulated last year. The voting was 36 to 30.

The conference also agreed to urge an addition of 2,500 tons to the Inkerman mill peak quota under the official proclamation.

The reason was that Inkerman had, through diversion of cane to another area, been deprived of the full benefit of its maximum production in the allocation of the 1929 quotas.

The equalisation scheme set out that the peaks and the pooling system should be unchanged, except for two suggested alterations, to give relief to certain sections.

The main alteration was that, if the No. 1 pool price could be declared at an average amount more than £17 a ton, that excess, provided it did not exceed 12s. 6d. a ton on No. 1 pool sugar, and subject to certain other minor provisos, should be made available for distribution to the producers of No. 2 pool sugar.

Another provision was that the lighterage on excess sugar should be met by the common pool instead of being, as at present, paid by the areas concerned.

Chloris Grasses in Queensland.

S. L. EVERIST, Assistant to Research Officer.

PART IV.*

THIS is the final part of the series. The species dealt with in this part are some of minor importance. They belong to various groups, and one new species is included. This was sent in during the course of the work.

CHLORIS UNISPICEA.

(Plate 150.)

Botanical Name.—*unispicea,* from Latin *unus* = one and *spica* = a spike, referring to the fact that the inflorescence usually consists of a single spike or raceme.

Common Name.—I have heard of no satisfactory common name for this species.

Botanical Description.—Slender, tufted grass, apparently perennial but perhaps sometimes annual, up to 60 cm.; rhizome very short, scaly, rhizome buds small; culms weak, slender, erect or drooping near the top, 3-5-noded, branched from the lower nodes, internodes terete, smooth, much longer than the leaf sheaths; leaf sheaths about 2 cm. long, flattened, keeled, striate, with loose cottony hairs on and near the margins, margins thin and scarious; auricles small, with long hairs; ligule a minute ciliolate rim with a few long hairs; collar rather conspicuous, glabrous, yellow; leaf blades conduplicate, conspicuously narrower than the sheath, 5-10 cm. long, 1 mm. broad at the base, tapering to a very fine point, glabrous except for a few long hairs near the base, scabrous above, particularly near the apex; flowering culms weak, up to 35 cm. long, slender, terete, smooth, terminating in one, two, or rarely three ascending racemes; racemes slender, with two rows of imbricate spikelets closely appressed to the rhachis; spikelets 2-flowered; lower glume 3 mm. long, acuminate, thin, membranous, 1-nerved, keeled, keel scabrous, tapering to a fine point; upper glume similar but 5 mm. long; lower floret hermaphrodite; lemma 5 mm. long, glabrous except for the scabrous tip, linear-lanceolate in profile, lanceolate in outline, 3-nerved, bluntly keeled, margins inrolled, tapering into a fine straight scabrous awn up to 10 mm. without or with obscure lateral lobes; palea thin and membranous, 5 mm. long, lanceolate, 2-nerved, 2-keeled; lodicules very minute, oblong cuneate, very thin; stamens 3; ovary flattened, styles and stigmas 2, stigmas laterally exserted; caryopsis 3 mm. long, linear-lanceolate in outline, with ridge on one side and groove on the other, dark brown in colour, embryo one quarter the length of the caryopsis; rhachilla terete, smooth, 1·5 mm. long; upper floret reduced to an empty lemma similar in shape and texture to lemma of lower floret but 1·5 mm. long with an awn up to 4 mm.

Popular Description.—A slender, tufted grass about 1-2 feet high, with long, slender, drooping seed head. Leaves very narrow and somewhat wiry. Seed heads of one or two slender spikes on top of a long slender stalk. Spikes narrow with two rows of small, narrow spikelets or "seeds." Each spikelet with two bristles.

* Part I. of this series was published in May, 1935 (Vol. XLIII., Part V., p. 474, *Queensland Agricultural Journal*); Part II., July, 1935 (Vol. XLIV., Part I., p. 18, Q.A.J.); Part III. in February, 1937 (Vol. XLVII., Part II., p. 181, Q.A.J.).

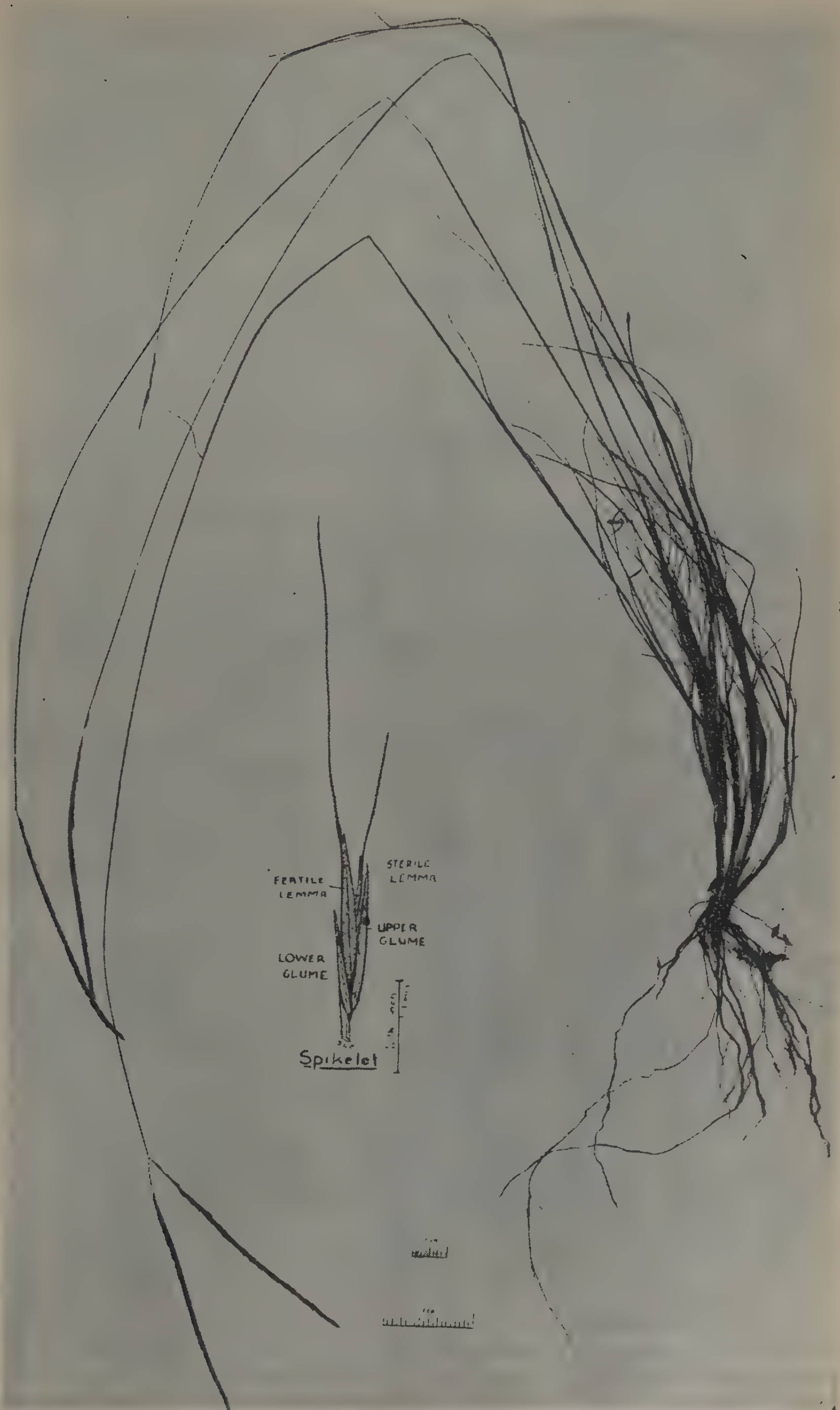


Plate 150.
Chloris unispicea.

Distribution.—*Chloris unispicea* is found principally in the Port Curtis, Wide Bay, Burnett, and Moreton districts. However, it has been found also at Clermont and Chinchilla.

Habitat.—The grass is found in a variety of situations. It commonly occurs along tracks in the drier "scrubs" or rainforests. It is common on some of the acid volcanic mountains of South-East Queensland such as Mount Edwards and Flinders Peak, where it grows in very shallow soils right up to the top of the mountains. It is also plentiful on soils derived from the Bunya Phyllite series of the Brisbane Schist.

Fodder Value, &c.—Little is known of its fodder value. However, it is scarcely leafy enough to be of very great importance as a fodder.

Reference.—Chloris unispicea *F.v.Muell. Fragm.* vii., 118 (1870).

CHLORIS PECTINATA.

(Plate 151.)

Botanical Name.—*pectinata,* from Latin *pectinatus* = a comb, referring to a comb-like arrangement of the spikelets.

Common Name.—In common with other Chloris grasses of the same habit, notably *Chloris divaricata* and *C. truncata,* this grass has received a number of names such as Star Grass, Umbrella Grass, and Windmill Grass. However, at the present time we know of no satisfactory common name applied to this species only.

Botanical Description.—Stoloniferous perennial, sometimes annual, stolons usually short and much branched, the plant growing in short dense tufts, eventually becoming almost a continuous sward; young shoots flattened: culms branched from the lower nodes; leaves distichous; leaf sheaths flattened, keeled, striate, 3-10 cm. long; margins thin, membranous; ligule thin, about 0·5 mm. long, minutely ciliate on the edge; auricles small, glabrous; collar very minute, glabrous: leaf blades strongly keeled, conduplicate, flat when very old, 3-8 cm. long, about 3 mm. wide at the base, linear-lanceolate, acute, glabrous or scabrous, tip scabrous or shortly ciliate: flowering culms erect, rigid, 10-20 cm. long, sometimes longer: racemes 4-9, in var. *fallax* usually 4-7, stiffly divaricate or slightly reflexed, 5-7 cm. long; rhachis triquetrous, scabrous, swollen and hairy at the base: spikelets densely imbricate, pectinate, subsessile in two rows on the lower side of the rhachis: spikelets 2-flowered; glumes thin, membranous, 1-nerved, keeled, keels scabrous, lower glume 2-2·3 mm. long, acute, upper glume 3-3·5 mm. long, acuminate, keel prolonged into a short, scabrous point: lower floret hermaphrodite; lemma linear-elliptic or linear-rhomboid in profile, oblanceolate in outline, cartilaginous, lemon-yellow or sometimes brown when ripe, glabrous except for the shortly ciliolate upper margins, 3-nerved, the central nerve produced into a slender, scabrous awn up to 15 mm. long, lateral nerves near the margin, produced into slender, scabrous lateral lobes 1·5-2 mm. long; palea 3-3·5 mm. long, thin, membranous, 2-nerved, 2-keeled, shortly ciliate on the keels; lodicules 2, minute, cuneate, membranous; stamens 3, anthers shorter than the filaments; ovary linear, sessile; styles 2, stigmas 2, laterally exserted; caryopsis 3 mm. long, trigonous, linear or oblong-linear, brown, embryo less than half the length of the caryopsis: rhachilla 1 mm. long, terete, smooth: upper

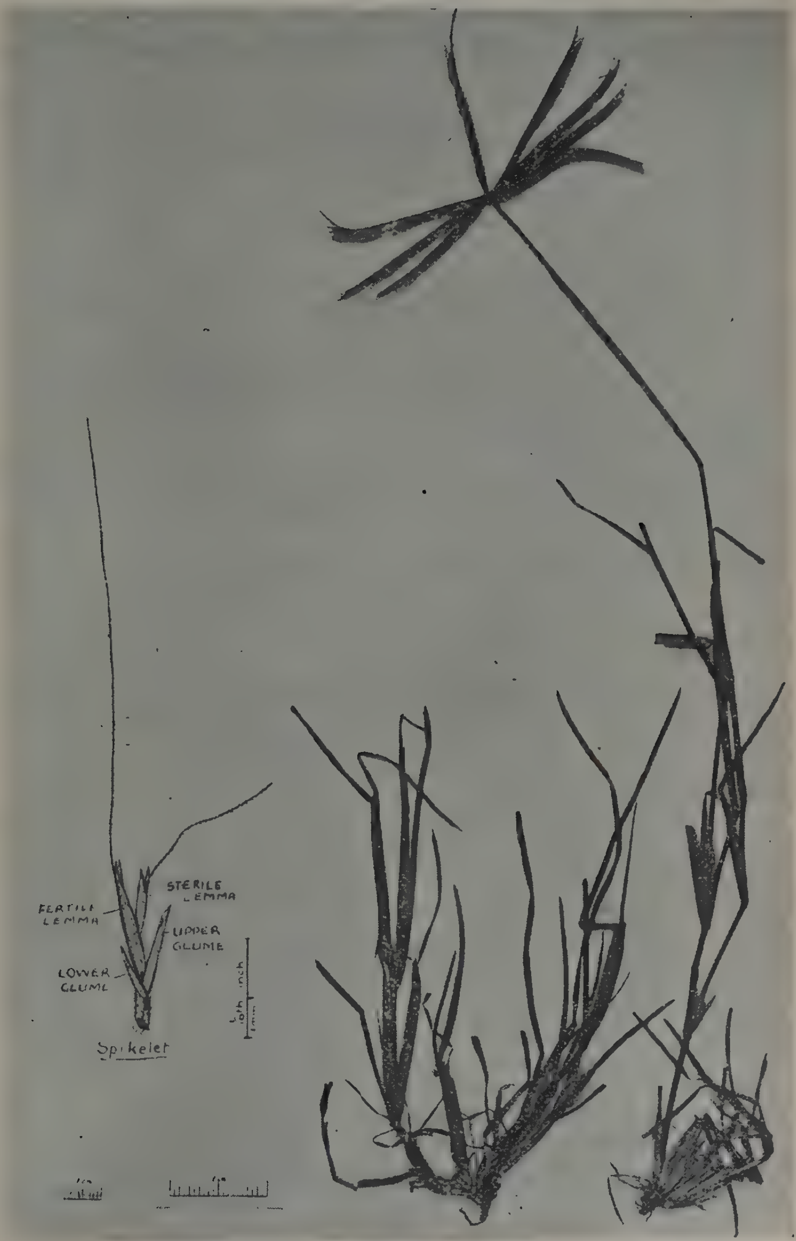


Plate 151.
Chloris pectinata.

floret reduced to an empty lemma; lemma 1·5-2 mm. long, thinly cartilaginous, elliptic in profile, oblanceolate in outline, 3-nerved, central nerve produced into a slender scabrous awn up to 10 mm. long, lateral nerves produced into short bunt lobes.

var. *fallax* Domin differs in having more slender racemes and slightly smaller spikelets.

Popular Description.—Creeping grass forming a sward when well grazed. Leaves short, pale-green, flattened; young shoots flattened. Seed heads of a number of short, stiffly-spreading spikes radiating from the top of a rigid erect stalk. Each spike bears two close, even rows of spikelets or "seeds" in a comb-like arrangement. Each spikelet has two long bristles.

Distribution.—*Chloris pectinata* is widely distributed in Queensland. It is very common in parts of Western Queensland, particularly along the edges of claypans.

Habitat.—The grass is found in a variety of situations but reaches its maximum development in low-lying areas of clay soils such as gilgais and claypans of Western Queensland.

Fodder Value, &c.—*Chloris pectinata* is quite a useful grass for sheep. It is generally too short for larger stock. When heavily grazed by sheep it tends to run out and form a sward.

Reference.—Chloris pectinata *Benth. Fl. Austr.* VII., p. 612 (1878).

CHLORIS PUMILIO.

(Plate 152.)

Botanical Name.—*pumilio,* from Latin *pumilio* = a dwarf, referring to the small stature of the plant.

Common Name.—This grass does not appear to have received any distinctive common name.

Botanical Description.—Tufted annual, up to 45 cm. high; roots fibrous; culms 3-5-noded, erect or geniculate at the base, unbranched or branched from the lowest nodes, internodes green, striate, nodes glabrous, not swollen: young shoots flattened: leaves distichous; leaf sheaths flattened, striate, acutely keeled, shorter than the internodes, 2-3 cm. long, edge of sheaths towards the apex with long silky hairs; ligule a short ciliolate rim with a few long hairs; auricles small, with a few long hairs; collar narrow and inconspicuous, lemon-yellow; leaf blades conduplicate, flattened when very old, rigid, 5-15 cm. long, 2·5 mm. wide at the base, tapering to a rounded apex, primary nerves 5-7, including the midrib, blades keeled, scabrous above, glabrous and smooth beneath, margins scabrous: flowering culms erect, striate; racemes exserted, 4-8, rigid, obliquely ascending and closely clustered, 2-5 cm. long, bearing spikelets from the very base, rhachis triquetrous, scabrous, with a dense cluster of short hairs at the base: spikelets closely imbricate in two rows on the lower side of the rhachis, 2-flowered; lower glume 2·5 mm. long, lanceolate-acuminate, thin, membranous, 1-nerved, keeled, keel thickened, scabrous; upper glume 4·8-5 mm. long, acuminate, thin, membranous, 1-nerved, keeled, keel scabrous, produced into a fine awn up to 1 mm.; lower floret hermaphrodite; lemma lemon-yellow when young, usually black when ripe, 4 mm. long, linear elliptic in profile, elliptic in outline, scabrous except for silvery hairs at base and at apex

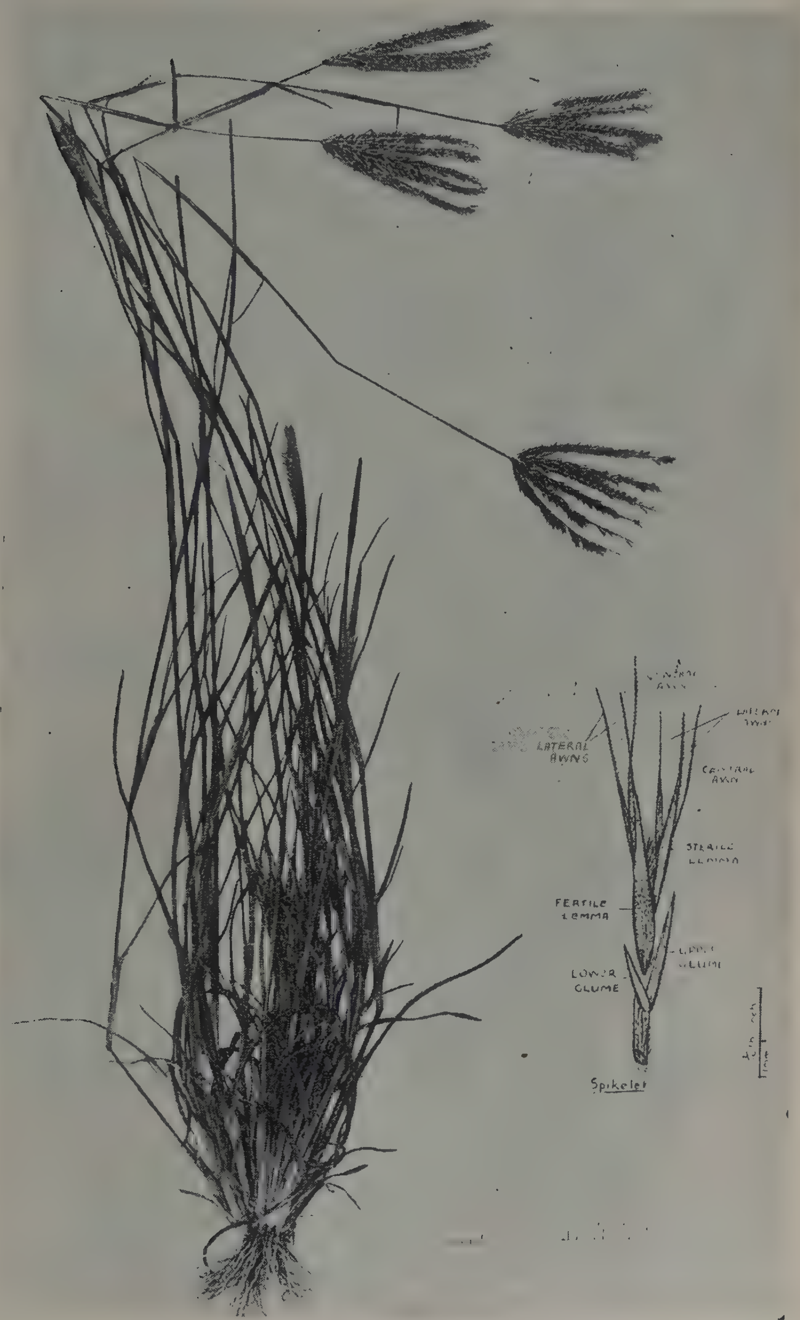


Plate 152.
Chloris pumilio.

of inrolled margins, 3-nerved, strongly keeled, margins inrolled, central nerve produced into a scabrous awn 6-8 mm. long, lateral nerves produced into scabrous, awned, lanceolate lobes 5-7 mm. long, including the awn; palea 3 mm. long, elliptic-oblong, thin and membranous, 2-nerved, 2-keeled, shortly ciliate on the keels; lodicules 2, minute, thin, narrow-cuneate; stamens 3; ovary linear; styles and stigmas 2, stigmas laterally exserted; caryopsis brown, trigonous, 3 mm. long, glabrous, embryo nearly half as long as the caryopsis: rhachilla terete, smooth, 1 mm. long; upper floret reduced to an empty lemma consisting of a central scabrous awn 5-6 cm. long and two lanceolate-awned lateral lobes, 4-5 mm. long, including the scabrous awns.

Popular Description.—A small tufted grass, with upright seed heads. Leaves stiff, green, flattened. Seed heads consisting of 4 to 10 short stiff branches radiating from the top of an upright stalk. Each branch of the seed head bearing two close rows of spikelets or "seeds" which become black when ripe. Each spikelet bearing two large, and four smaller conspicuous bristles.

Distribution.—*Chloris pumilio* appears to be confined to tropical Australia. It was originally collected by Robert Brown on Islands off the North Coast. Since then specimens have been collected from the Norman and Gilbert Rivers, Mareeba, Mount Mulligan, Atherton, and between Townsville and Rollingstone.

Habitat.—This grass apparently favours low-lying situations such as swamps and river frontages.

Fodder Value, &c.—Nothing is known of its fodder value. It should be quite useful but of no particular importance because of its limited distribution.

Reference.—Chloris pumilio *R. Br. Prodr.* i, 186 (1810).

CHLORIS RUDERALIS.

(Plate 153.)

Botanical Name.—*ruderalis,* from Latin *rudus* = old rubbish, referring to the fact that the plant was originally found by Dr. Domin as a weed of disturbed land.

Botanical Description.—Annual: culms erect or geniculate ascending, sometimes rooting at the lowest nodes, little branched and then only from the lowest nodes; internodes glabrous, striate, longer than the leaf sheaths; nodes glabrous, slightly swollen; young shoots flattened; leaves distichous; leaf sheaths striate, sharply keeled, glabrous except for a few long hairs on the margins near the apex, 2-5 cm. long, sheaths of upper culm leaves rather loose; auricles brown with long white hairs; ligule reduced to a densely ciliolate rim; collar brownish-yellow, 0·5 mm. long at midrib, broadening to 1 mm. on margins, glabrous; leaf blades 6-13 cm. long, flat, 3·5-4 mm. broad at the base, tapering to an acute apex, upper surface scaberulous with a few long hairs at the base, lower surface glabrous except for the scaberulous midrib, margins scaberulous, primary nerves 7, including the prominent midrib: flowering culms erect, striate, racemes exserted; racemes 4-8, closely appressed and thus obliquely erect, 4-8 cm. long, rhachis triquetrous, slender, scabrous, with short hairs at the base, bearing from the base two unilateral imbricate rows of closely appressed spikelets: spikelets 2-flowered; glumes thin, membranous, 1-nerved, keeled, scabrous on the keels, lower glume lanceolate-acuminate, 1·5-2·5 mm. long, upper glume lanceolate-acuminate,

3-5 mm. long, including the 1 mm. long, scabrous awn: lower floret hermaphrodite; lemma to the awn about 4 mm., cartilaginous in texture, keeled and laterally compressed, irregularly rhomboid in profile, broadly elliptic in outline, glabrous except for tufts of long hairs at the base and on the margins near the apex, margins inrolled, lemma 3-nerved,

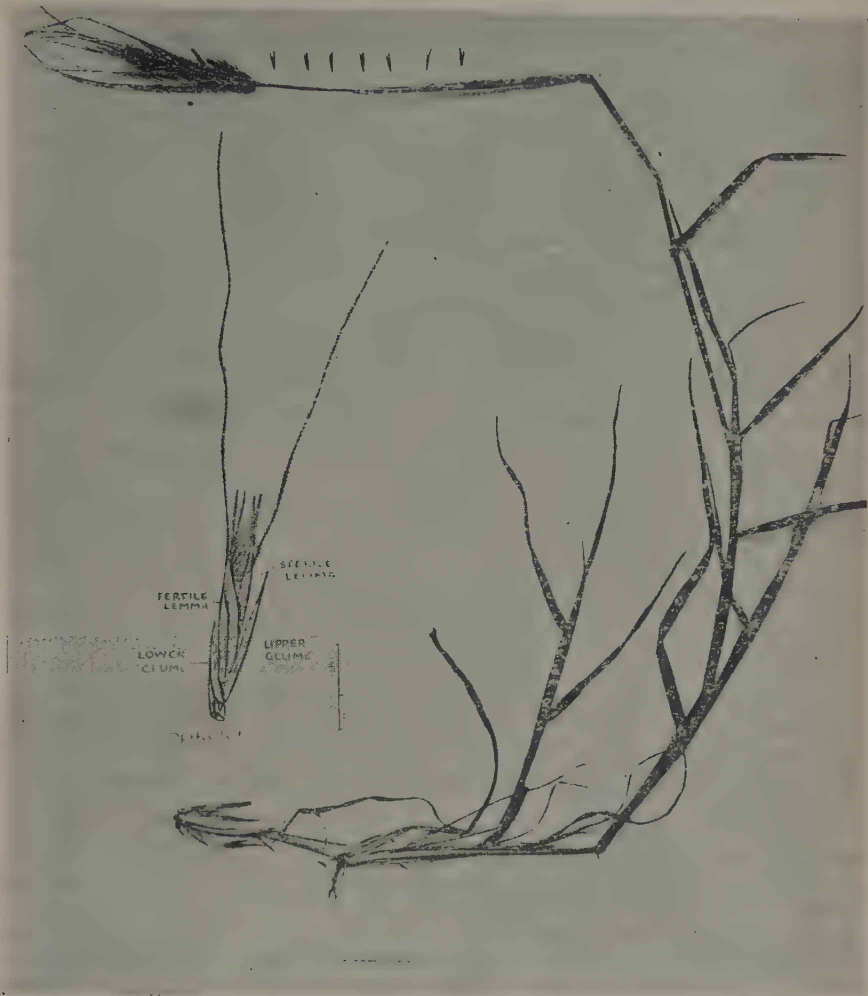


Plate 153.
Chloris ruderalis.

the central nerve prolonged into a slender scabrous awn up to 20 mm. long, lateral nerves near the margins, continued into the lanceolate-acuminate lateral lobes which terminate in a short awn or mucro, lateral lobes, including the awns, up to 4 mm. long; palea 3 mm. long, very thin, elliptic, 2-nerved, 2-keeled, glabrous; lodicules 2, 0·3 mm. long, thin, irregularly cuneate; stamens 3, anthers shorter than the filaments, linear-oblong, 0·4-0·5 mm. long; ovary small, oblong; styles and stigmas 2, stigmas laterally exserted; caryopsis dark-brown, trigonous, linear-elliptic in outline, minutely truncate at the apex, base acute, 2-2·3 mm.

long, embryo nearly half the length of the caryopsis; upper floret reduced to an empty lemma borne on a terete, 1 mm. long rhachilla, lemma linear, glabrous, 1 mm. long, excluding the lobes, 2-lobed with a scabrous central awn up to 15 mm. between the lobes, lateral lobes up to 2 mm. long, sometimes with a short scabrous mucronate tip.

Popular Description.—An annual grass, rather loosely tufted and sometimes rooting from the lowest joints of the stems, stems erect or somewhat spreading at the base. Leaves flat, fairly broad and slightly rough to the touch. Seed heads consisting of a bunch of spikes clustered at the top of a short stalk. Each spike with two close even rows of spikelets or "seeds." Spikelets generally black when ripe, with two long slender bristles on each.

Distribution.—So far as is known at present, the grass is confined to Queensland. We have many specimens from the Gilbert River, some from the Cairns hinterland, and two or three from Townsville. On the tableland back from Cairns and at Townsville the grass seems to be a weed. It may possibly have come originally from the Gilbert River.

Habitat.—Little is known of the habitat of the grass. From the Gilbert River it has been described as occurring in damp hollows. In its other situations it seems to be a weed of disturbed land.

Fodder Value, &c.—Nothing is known of its fodder value, but it should be quite a useful grass while it lasts.

Reference.—Chloris ruderalis *Domin Bibl. Bot.* 20, heft 85, 365 (1915).

CHLORIS SCARIOSA.

(Plate 154.)

Botanical Name.—*scariosa,* from Latin *scaria* = a thorny shrub. The original Latin meaning has been modified into the botanical term scarious meaning thin, dry and membranous, not green, referring to the scarious lobes on the lemmas of the spikelets.

Common Name.—No satisfactory common name is available.

Botanical Description.—Tufted annual, sometimes perennial up to 1 metre, usually 30-50 cm.; culms slender, erect, rigid, unbranched or branched only from the lower nodes; nodes slightly swollen, glabrous; internodes terete, scaberulous, longer than the leaf sheaths: leaves green; sheaths terete, glabrous, scaberulous, striate, not or only slightly keeled, towards the apex loose and slipping from the culms, margins inrolled on the free part: auricles yellow, inconspicuous, glabrous; ligule 0·8 mm. long, membranous, margin broken into numerous, fine irregular teeth; collar narrow and inconspicuous, glabrous: leaf blades flat, conspicuously narrower than the sheaths, scaberulous above, sometimes with long hairs at the base, smooth or slightly scaberulous beneath, 1·5-1·8 mm. broad at the base, 10-20 cm. long, tapering to a fine point, primary nerves 5, including the midrib: flowering culms rigid, erect, terete, terminating in 4-5 digitate racemes; racemes clustered, appressed, 3-5 cm. long, bearing unilaterally two rows of closely imbricate spikelets: spikelets 4-7 flowered; glumes thin, membranous, 1-nerved, scarcely keeled, lower glume 4 mm. long, elliptic-oblong, emarginate, upper glume 5 mm. long, broadly oblanceolate, apex shortly bifid; lowest floret hermaphrodite, borne on a 2·5 mm. long, densely hairy rhachilla; lemma 2 mm.

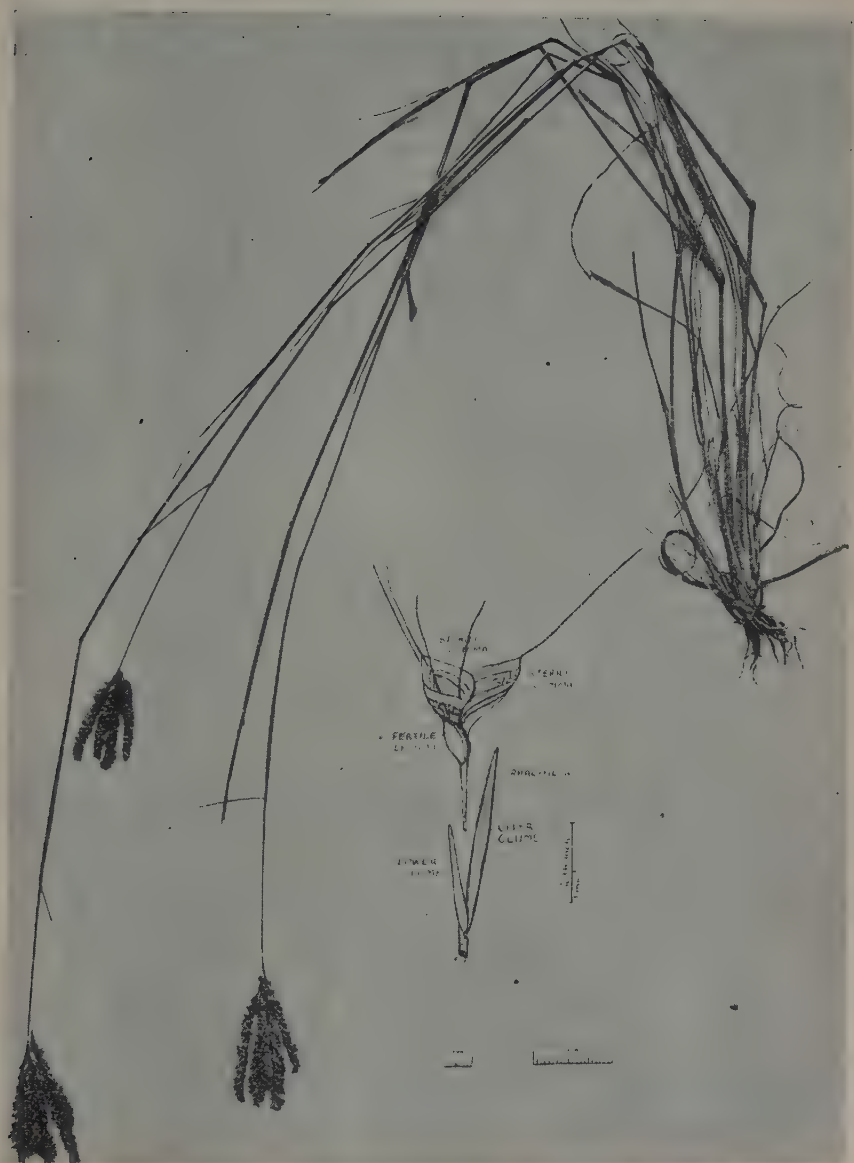


Plate 154.
Chloris scariosa.

long, folded and keeled, irregularly rhomboid in profile, ovate in outline, glabrous except for tufts of long white hairs at the base of the keel and a fringe of erecto-patent hairs on the margin near the apex, 3-nerved, central nerve prolonged into a slender scabrous awn up to 7 mm. long, lateral nerves near margins, margins scarious, base of central awn flanked by 1 mm. wide scarious margins of the lemma; palea 2·5 mm. long, obovate-elliptic, thin and membranous, 2-nerved: lodicules 2, 0·2 mm. long, cuneate, thin: stamens 3, anthers oblong linear, 0·8 mm. long; ovary sessile or shortly stipitate, obovate, truncate; styles and stigmas 2, stigmas laterally exserted; caryopsis brown when ripe, dull, 1·5-2 mm. long, obovate trigonous, angles rounded, embryo almost as long as the caryopsis: second floret shortly pedicellate, reduced to an empty lemma, lemma thin, scarious, orbicular in outline, spreading, 7-nerved, central nerve prolonged into a 2 mm. long scabrous awn, lateral nerves becoming shorter towards the margin: third floret similar to second but slightly smaller; fourth and, if present, subsequent florets similar to second, but considerably smaller and almost completely enclosed by the second and third florets.

Popular Description.—A tufted erect grass with slender rigid stems. Leaves green, flat, tapering to fine points. Seed heads of 4 or 5 closely clustered spikes on top of a slender upright stalk. Spikes with two very dense rows of spikelets or "seeds," spikelets with thin, dry papery husks and two or more short bristles.

Distribution.—*Chloris scariosa* is fairly widely distributed in Queensland. It has been collected from the Gulf country, Windorah, Quilpie, Blackall, and other western localities, Townsville, Rockhampton, and other places along the north coast. It has also been recorded from the Northern Territory.

Habitat.—The grass apparently thrives on a variety of soils. It has been collected from black soil flats, sandy soil, and gravelly ridges.

Fodder Value, &c.—*Chloris scariosa* springs up very rapidly after rain, and most reports say that stock are fond of it. In addition, it is one of the most attractive of our native grasses from a decorative point of view and keeps well when cut.

Reference.—Chloris scariosa *F. v. Muell. Fragm.* vi., 85 (1867).

CHLORIS DICHANTHIOIDES.

(Plate 155.)

Botanical Name.—From *Dichanthium,* the botanical name of Blue Grass, and oides from Greek *eidos* = resemblance, referring to the fact that the plant bears some superficial resemblance to Blue Grass (*Dichanthium sericeum*).

Common Name.—No common name is known for this plant.

*Botanical Description.**—Densely tufted perennial up to 60 cm.; rhizomes short; innovation buds mostly on outside of the tussocks, enclosed in stiff, hard, densely inbricate scales: culms somewhat wiry, erect or drooping towards the top, few noded, branched from the lowest nodes; lowest internodes shorter than, upper internodes longer than the leaf sheaths, internodes glabrous, terete, smooth or slightly striate; nodes glabrous: leaves pale green, rather stiff; leaf sheaths striate, keeled,

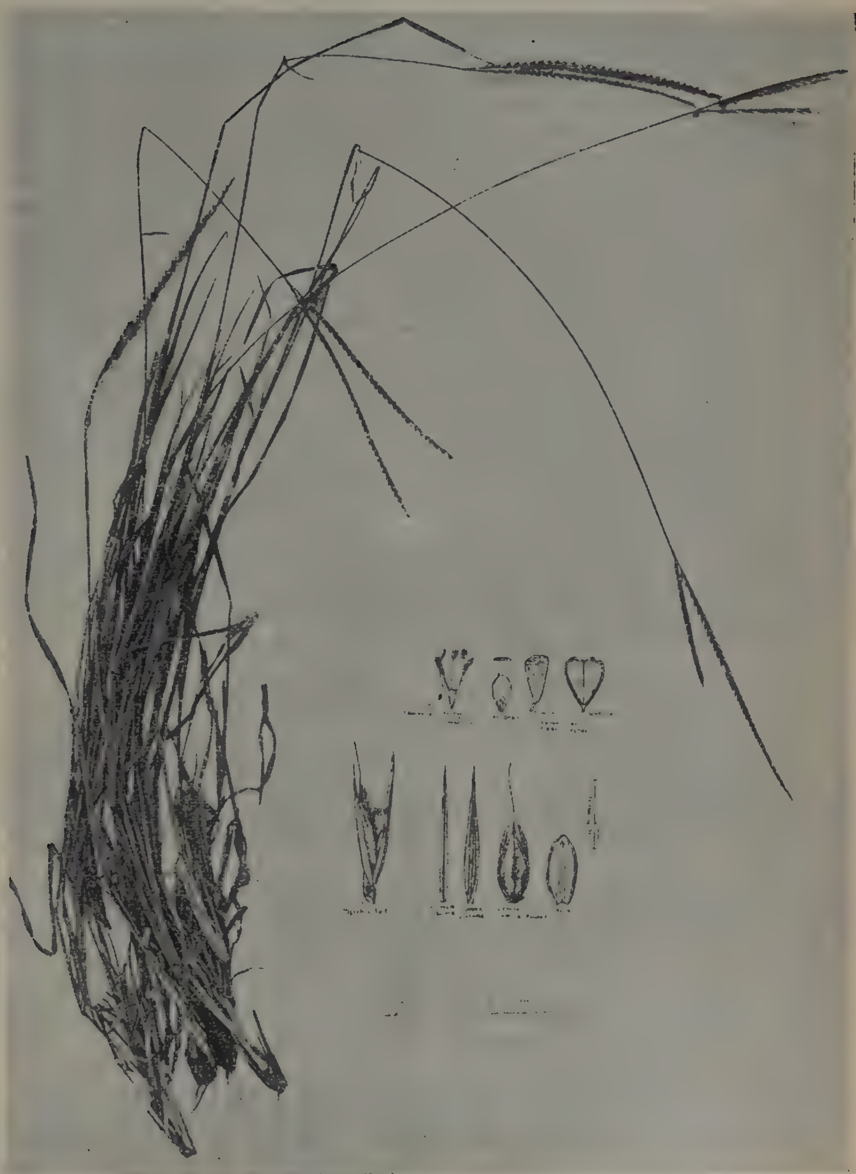


Plate 155.
Chloris dichanthioides.

scaberulous, upper part slipping from the internodes, margins thin; auricles narrow and inconspicuous; ligule reduced to a ring of dense hairs; collar not conspicuous; leaf blades 5-17 cm. long, flat, 2-2·2 mm. wide at the base, tapering to a fine scabrous point, glabrous and smooth below, scaberulous above, margins with distant short reflexed hairs or teeth: flowering culms long, slender, terete, smooth, drooping somewhat, bearing at the top 2 digitate racemes or spikes only slightly divergent from each other, 6-9 cm. long; spikelets in two even imbricate rows on the lower side of each raceme; rhachis triquetrous, scabrous, with a tuft of long hairs at the base: spikelets subsessile, 2-flowered: glumes subequal or the lower slightly longer than the upper; lower glume 5-6 mm. long, thin, membranous, acuminate, 1-nerved, keeled, keel scabrous; upper glume 5 mm. long, thin, membranous except for the nerves, lanceolate-acuminate, 3-nerved, not keeled: lower floret hermaphrodite, almost enclosing the upper; lemma 3 mm. long, thinly cartilaginous, bluntly keeled, rhomboid-elliptic in profile, ovate in outline, glabrous except for tufts of hairs at the base, along the keel and along each margin above the middle, 3-nerved, central nerve prolonged into a scabrous awn up to 3 mm., lateral nerves near the margin, lateral lobes very minute or none: palea the same size as the lemma, thin, membranous, 2-nerved, 2-keeled; lodicules 2, thin, 0·2 mm. long, irregularly cuneate; stamens 3, anthers shorter than the filaments, oblong, 0·3 mm. long; ovary sessile, obovate-cuneate, styles and stigmas 2, stigmas laterally exserted: caryopsis flattened or plano-convex, obovate, truncate, 1·5 mm. long, embryo about one-third the length of the caryopsis: upper floret reduced to an inflated empty lemma borne on a short terete rhachilla, lemma 1·7-2 mm. long, narrowly cuneate in profile, broadly cuneate in outline, emarginate, glabrous, 3-nerved, margins inrolled.

This species appears to be most closely related to *Chloris ventricosa* R. Br. It differs from that species in the following important respects:— The inflorescence has only two spikes, both of which are stiffly but obliquely erect, the glumes are subequal and much exceed the florets, the upper glume is 3-nerved, the fertile floret is only shortly awned and the sterile floret is awnless and emarginate. Other points of difference are observable but the above will be sufficient to distinguish the species.

Popular Description.—A tufted, perennial grass, of slender weeping habit. Leaves pale green, rather stiff and rough to the touch, tapering to fine points. Seed heads of two spikes on top of a long slender purplish

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* To comply with the International Rules of Botanical Nomenclature, the following Latin diagnosis, kindly translated for me by Mr. C. T. White, is given. I am much indebted to Mr. White for this assistance.

Chloris dichanthioides sp. nov.

Gramen perenne, caespitosum, ad 60 cm. altum: culmi erecti apicem versus nutantes: folia rigida; vaginæ striatæ; auriculae angustæ, inconspicuæ; ligula ad seriem ciliorum densiorum redacta; laminæ planæ, 5-17 cm. longæ, apicem versus in acumen scabrum angustatæ: racemi 2, leviter divergentes, 6-9 cm. longi: spiculæ biseriatæ in latere inferiori ramorum dispositæ, bifloræ, subsessiles; glumæ subæquales vel inferior leviter longior; inferior 5-6 mm. longa, 1-nervis; superior 5 mm. longa, 3-nervis; anthœcium inferum hermaphroditum; lemma 3 mm. longum, ovatum, ad basin et carinam et marginem in parte superiori fasciculis pilorum instructum, trinerve; nervus medius in aristam 3 mm. longam attenuatus; palea 3 mm. longa, 2-nervis; stamina 3, antheræ filamentis breviores, 0·3 mm. longæ; ovarium obovato-cuneatum; caryopsis plana vel plano-convexa, obovata, truncata, 1·5 mm. longa: anthœcium superum ad lemma vacuum, inflatum, 1·5-2 mm. longum, late cuneatum, emarginatum, marginibus incurvis redactum.

drooping stalk. Spikes with two close even rows of spikelets or "seeds." Spikelets with long outer husks enclosing two more inflated husks or lemmas and with one short bristle.

Distribution.—The species is named from a single collection made at Oakwood, north of Charleville, by Mr. W. White, in May, 1936. The type specimen is in the Queensland Herbarium, and co-type material has been forwarded to the Herbarium of the Royal Botanic Gardens, Kew, England.

Habitat.—Mr. White states that the specimens were collected on red soil along the edges of watercourses.

Fodder Value, &c.—According to Mr. White this is an uncommon perennial grass which appears to be relished by cattle.

Reference.—Chloris dichanthioides *sp. nov.*

KEY TO THE SPECIES OF CHLORIS NATIVE OR NATURALISED IN QUEENSLAND.

To aid in the identification of the species it has been thought desirable to include a key to the species, either native or naturalised, in Queensland. It is regretted that this was not given at the commencement of the work, but pressure of other work did not permit. The key is purely artificial although related species have been kept together as much as possible without sacrificing convenience of working.

A. Spikelets strictly two-flowered. Upper floret reduced to an empty lemma.

B. Lemmas unawned, dark brown in colour; racemes more than 30 .. .. *C. distichophylla*

BB. Lemmas, at least the lower, awned; racemes less than 30.

C. Lower lemma acuminate, often with acute or acuminate lateral lobes, never inflated nor truncate.

D. Inflorescence very slender and weak, racemes 1-3, very slender, not spreading .. .. .. *C. unispicea*

DD. Inflorescence not weak, or if so, then racemes divaricate and more than 3.

E. Lower lemma glabrous, or at the most scabrous, lateral lobes not prominent.

F. Racemes stiffly spreading in more than one plane. Lower lemma scaberulous, without lobes or lobes very obscure, tapering into a strong, rigid awn; leaf blades inrolled in the bud, not flattened; leaves glaucous .. .. *C. acicularis*

FF. Racemes divaricate but more or less in one plane. Lower lemma with small but appreciable acute lateral lobes; awns slender; leaf blades flattened in the bud, leaves green.

G. Racemes long, slender and somewhat weak, 8-15 cm. long, spikelets appressed to the rhachis, not obviously pectinate .. .. *C. divaricata*

GG. Racemes shorter, stouter, more rigid, often reflexed, persistent glumes obviously pectinate .. .. *C. pectinata*

EE. Lower lemma with tufts of hairs on the upper margins, lateral lobes usually prominent and awned.

H. Small, densely tufted plants; lemma with lateral lobes having awns nearly as long as the central awn; central awn up to 8 cm. racemes short and stout .. *C. pumilio.*

HH. Loosely tufted plants; lemmas with lateral lobes shortly awned, much shorter than the central awn; central awn up to 14 cm. .. .. *C. ruderalis*

EEE. Lower lemma with tufts of long hairs on upper margins; lateral lobes not conspicuous; central awn about 25 cm. .. .. .. *C. virgata*

CC. Lower lemma truncate, inflated, margins of the lemma inrolled, lateral lobes, if any, inrolled.

I. Lower lemma linear-oblong in profile, truncate, not enclosing the upper floret; racemes long and slender; creeping plants .. .. *C. truncata*

II. Lower lemma rhomboid elliptic in profile, totally or partially enclosing the upper floret; racemes shorter or stouter; robust, usually erect plants.

J. Lower glume shorter than the upper, not exceeding the florets; upper glume 1-nerved; racemes 3 or more, upper lemma awned .. .. *C. ventricosa*

JJ. Lower glume as long as or longer than the upper, much exceeding the florets; upper glume 3-nerved, racemes 2, upper lemma emarginate .. .. *C. dichanthioides*

AA. Spikelets usually more than two flowered.

K. Lemmas inflated, purple when ripe .. .. *C. barbata*

KK. Lemmas not at all or only slightly inflated, white or dark brown when ripe.

L. Upper lemmas without broad scarious margins.

M. Second floret always empty; lower lemma with tufts of long white hairs on margin and keel; awn about 25 cm. .. .. *C. virgata*

MM. Second floret often (not always) hermaphrodite; lower lemma glabrous except for very short marginal tufts of hairs; awn about 10 cm. .. *C. Gayana*

LL. Upper lemmas with broad scarious margins, spikelets 4-7 flowered .. .. *C. scariosa*

UTILISATION OF SWAMP LANDS.

Throughout a considerable stretch of the northern coastal country swampy areas of lesser or greater extent are encountered, particularly in the wetter regions where dairying is now being developed. These lands, to a large extent lying idle, could, at no great cost, be utilised by planting them with para grass. This grass is easy to establish, because of its habit of rooting freely at the nodes. It is a rather coarse, vigorous grower, but has succulent stems and leaves and gives a large quantity of green material per acre. Under favourable conditions, yields of over 30 tons per acre have been obtained in one year. It is easily cut back by frost, and is, therefore, most suitable for the warmer localities.

This grass grows well in swampy localities, the runners going out even into deep water. Once established, it holds its own with any other grass. It has a further advantage in that it is credited with completely drying out marsh lands.

Para grass is usually propagated by runners, which root readily. These runners can be easily planted in furrows about 3 feet apart and about the same distance between the rows.

—*T. G. Graham.*

Early Stone Fruit in the Warwick District.

C. SCHINDLER, B.Sc.Agr., Fruit Inspector.

THE light to medium sandy loams near Warwick are very suitable for the cultivation of apricots, plums, and peaches, and fruit grown there ripens earlier than at Stanthorpe. Loss from fruit fly is serious at times, but the pest can be controlled and kept in check during the ripening period of these early fruits by proper trapping, prompt destruction of fallen fruit, and as an aid to the latter the suppression of weeds around the trees. There is a keen demand for early stone fruit of good quality. One grower sent over 2,200 cases of early apricots to Brisbane and Rockhampton during the past season, obtaining up to 14s. a case, and the agents who handled this fruit reported that it was practically free from fly.

Suitable Soils and Sites.

Light to medium sandy loams are the best soils for growing good-quality fruit, and both the red and light-coloured types appear to be suitable. Good drainage is essential, and the systematic application of fertilizers is necessary. As the earliest fruit commands the best prices, an easterly aspect is advantageous. Planting in low sheltered spots should be avoided, as these are cold and likely to harbour fruit fly. If the area is subject to flooding by water from higher up the slope, there is danger of erosion. On the whole, it is better to plant high up the slope and provide wind breaks of quick-growing trees round the outside of the orchard to prevent damage by wind.

Some consider that the trees naturally grow larger in the Warwick district than in some other parts, and therefore should be planted further apart. However, if the trees are pruned reasonably heavily, the usual spacing of 20 feet (100 trees to the acre) can be used, and a greater yield per acre will be obtained.

Varieties.

For commercial plantings, only the earliest varieties of stone fruit are worth considering, as the price drops as soon as any quantity of fruit is forwarded from the Stanthorpe district, and fruit fly infestation becomes more serious as the season advances. Four varieties of apricots are grown successfully. The Glengarry is the earliest variety, and, given favourable conditions, will grow to a good size and be fit to market very early in November. The Newcastle Early follows this closely, and is of a good size and excellent flavour. This variety is a heavy bearer and the fruit carries well; it should constitute the bulk of any commercial planting. Oullin's Early and Moorpark are slightly later, but still command good prices; any variety which matures later than these is unprofitable.

Of the plums, Wilson and Santa Rosa (particularly the former) are worth a trial; there are no commercial orchards of these in bearing in the Warwick district, but as they ripen early there should be a good market for them. Mayflower and Brigg's Red May are the best of the early peaches. The earliest nectarines are grown locally, and an early variety of this fruit has a definite value.

Certain varieties of fruit trees harbour the fruit fly, and should on no account be grown amongst or adjacent to any orchard trees. Loquats and Early Gem plums are particularly subject to attack, and once the pest has gained a hold in these fruits it is well-established for the summer. Therefore, these fruits should be banished completely from any orchard property.

The climate of the Warwick district is unsuitable for the commercial production of apples and pears, and it is doubtful whether cherries would be a success. Almond trees grow vigorously, but rarely produce a crop; this is mainly due to lack of interpollination, and in some cases to frost injury when the fruit is setting.

Cultivation and Pruning.

Generally, clean cultivation throughout the year is practised, but the results of an analysis of soil from an orchard on rather shallow soil indicate that the addition of humus by the growing of a green manure crop during the winter and ploughing it under very early in the spring would improve the soil considerably; barley and field peas being recommended. Applications of animal manures (farmyard, sheep, and poultry) are also useful for this purpose. If a decline in vigour and productivity of the trees is noticed after some years, a complete fertilizer should be applied, but as an excess of fertilizer tends to make the fruit soft and slow to mature, it should be used with discretion.

The usual method of pruning deciduous fruit trees should be followed. Some trees bear very heavy crops alternately with light crops; this habit can usually be corrected by rigorous pruning just before a light crop is expected.

Pests and Diseases.

The greatest trouble of the stone fruitgrower is, of course, fruit fly. If the above recommendations as to the situation of the orchard and varieties planted are carried out, and the regulations for the control of fruit fly followed properly, this pest should give very little trouble while the early varieties are being harvested.

San Jose scale is found on the trees, although not common on apricots. It is effectively controlled by the compulsory winter spray of lime-sulphur, miscible oil, or tar distillate.

Both apricots and peaches are liable to "leaf curl," which is a fungus disease affecting the first-formed leaves. These become thickened, puckered, and discoloured, and soon fall off. Apricots and some varieties of plums may be affected by a rust which occurs on the young wood, leaves, and fruit. On the wood and leaves, golden-yellow postules form, while hard scabs are formed on the fruit, disfiguring it and thereby reducing its market value. A winter spray with lime-sulphur will help to control both these diseases, but if either become serious 6-4-40 Bordeaux mixture should be applied just as the buds commence to swell.

For the control of rust, a second spray may be required at petal fall. In the case of apricots this should be a 2-3-40 Bordeaux mixture, and for other stone fruits lime sulphur 1 in 50.

Some varieties of plums may suffer from bacterial spot, which produces cracks in the wood, a "shot hole" on the leaves, and large dark spots resembling a scald on the fruit. The use of Bordeaux mixture will control this disease, but rather more than the two applications mentioned above may be required to give satisfactory results. All wood showing the injury produced by prune rust or bacterial spot should be removed when pruning, and all prunings removed and burnt as soon as possible, as the diseases are carried over the winter in these lesions.

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture, and Chief Inspector of the Banana Industry Protection Board.

[*Continued from page* 331, *April*, 1938.]

PROPPING.

GOOD shelter is an important factor in the production of good-quality fruit, but by this is not meant that it is possible for all winds to be excluded from the plantation.

Coupled with the weight of the bunch, occasional high winds often make it necessary to prop the plants to prevent them from falling or being blown over, with a consequent loss of the bunch. This applies particularly to plantations after the bearing of the first crop. Usually, the best time to prop is when the fruit is about half-developed. Before this, the weight of the bunch is not heavy enough to overburden the plant.

The Cavendish variety, being of dwarf type, needs less propping than Mons Marie or Gros Michel, while Sugars and Lady Fingers rarely require propping at all, as their bunches are usually smaller in comparison.

Round bush timber makes fair props, but split or sawn timber is better and will last longer.

Naturally, the steeper the land on which the bananas are growing, the longer the props have to be cut, but on average hillsides, for Cavendish, a 6-feet to 7-feet prop is satisfactory. For Mons Marie and Gros Michel 10-feet props are required for the first crop and up to 16 feet for subsequent crops. The props should be rigid and strong enough to bear the weight they have to hold. Round timber props should have a diameter of at least 4 inches at the butt end; while split or sawn timber props should measure 1 x 1½ inches. The props should be pointed sharply (chisel-shaped) at the top end. This point is pressed into the collar of the plant, just below the bunch stem, and pushed up so as to take the weight. The lower end should be slightly embedded in the ground. Care must be taken to see that the prop is placed at such an angle as not to come in contact with the side of the bunch; otherwise serious rubbing may damage the fruit. Other effective ways of propping are to use two props instead of one, or two props fastened together about 9 inches from one end to form a crutch or fork.

The removal of the bunch flower at half-maturity or even earlier is recommended, because it wastes the plant's energy, increases the weight which the plant stem has to carry, and provides a harbourage for insect pests. Besides, its removal hastens the maturity of the bunch.

BAGGING.

Among banana-growers the practice of bagging bunches is often a subject of discussion. It has its advantages and disadvantages. The fruit is subject to much less blemish when bagged and, in addition, the fingers all round the bunch are developed to an equal degree. The cost of the bagging and extra labour certainly increases the cost of production, but on some plantations the grower is handsomely repaid for this extra expenditure. The question of whether to bag or not to bag is

Plate 156.

CAVENDISH BANANAS, MACADAMIA NUTS, AND KIKUYU GRASS GROWING ON THE SAME AREA.

This interesting system of land utilisation suggests the possibility of the successful combination of fruit and nut production with dairying.

Plate 157.

The prop must be sufficiently strong to bear the full weight. This particular prop is too weak.

one for the grower to decide for himself, but from observations it is suggested that on those plantations subject to exposure during the late autumn and winter bagging should be seriously considered.

In such plantations leaf fall usually occurs to such a degree that the bunch loses its natural shelter and, as a consequence, becomes somewhat hardened, fails to mature properly, and often carries blemishes caused by sun scald. If bagged, the majority of these bunches will mature, the bags providing a satisfactory shelter. Normally, these coverings should be put on to all bunches likely to be harvested during a period—from the beginning of May and then onwards until the end of September. Chaff bags are suitable, provided the bottom seam is opened up, thus allowing a view of the bunch from underneath without removing the tie on the bag proper. Tubular hessian now sold for this purpose is better than chaff bags. It is priced at 5½d. a yard. Hessian covers last for about two seasons—i.e., twelve months' actual wear. Heavier material has been tried, but with less success because of lack of sufficient air penetration when the bunch and bagging have become saturated after rain.

A small experiment tried recently with a light watertight material proved satisfactory. The material was made up in tubular form, slipped over the bunch and tied round the bunch stem in a way similar to the ordinary method. The cost of these envelopes was 6d. each, and if they outlast hessian covers they should be more economical.

[TO BE CONTINUED.]

QUEENSLAND SHOW DATES.

May.

Ipswich	17th to 20th
Warrilview	21st
Biggenden	26th and 27th
Gympie	26th to 28th
Dirranbandi	27th and 28th
Kalbar	28th
Toogoolawah	27th and 28th
Maryborough	31st May to 2nd June

June.

Maryborough	31st May to 2nd June
Biloela	2nd to 4th
Lowood	3rd and 4th
Childers	6th and 7th
Boonah	8th and 9th
Bundaberg	9th to 11th
Wowan—	
Show	9th and 10th
Rodeo	11th
Gin Gin	13th and 14th
Gladstone	16th and 17th
Marburg	17th and 18th
Rockhampton	21st to 25th
Mackay	27th to 30th
Kilcoy	30th June and 1st July

July.

Kilcoy	30th June and 1st July
Proserpine	1st and 2nd
Nambour	7th to 9th
Cleveland	8th and 9th
Ayr	8th and 9th
Townsville	11th to 14th
Rosewood	15th and 16th
Esk	15th and 16th
Charters Towers—	
Show and Rodeo	19th to 21st
Laidley	20th and 21st
Maleny	21st and 22nd
Cairns	26th to 28th
Gatton	28th and 29th
Caboolture	29th and 30th

August.

Atherton	2nd and 3rd
Pine Rivers	5th and 6th
Home Hill	5th and 6th
Royal National, Brisbane	15th to 20th

September.

Imbil	2nd and 3rd
Ingham	2nd and 3rd
Pomona	9th and 10th
Tully	9th and 10th
Beenleigh	16th and 17th

Plate 158.
Cavendish bananas on a hillside plantation, showing method of propping.

Plate 159.

A Mons Marie plantation at Lacey's Creek, Dayboro'; second cut hanging. Props used in this plantation average from 14 to 16 feet.

Observations on the Dairy Industry of the Irish Free State.

E. B. RICE, Dairy Research Laboratory.*

THE chief dairy product of Ireland is butter, the demand for milk for the liquid milk market being comparatively small in proportion to the total production, as, apart from Dublin, which has a population of about 500,000, there are few other large cities and towns. As in Australia, New Zealand, Denmark, and other leading dairying countries, the creameries (factories) are almost entirely co-operatively owned by the farmers. Cheesemaking has not attained a very prominent position in the country's exports. Irish Cheddar cheese, practically the only variety made, is produced in relatively small quantities. The local market absorbs almost the total output, the export value of cheese amounting only to about £20,000 yearly.

The chief dairying districts, which are in the south of the island, are endowed with a bounteous rainfall, well distributed over the whole year.

Some Observations on Irish Dairy Farming.

In common with most European dairying countries, Irish dairy farming is much more intensive than dairying under our Queensland conditions and the farms are correspondingly smaller, the average area probably being from 60 to 100 acres. There is here, as in the south of England, a growing tendency to keep mature dairy stock in the open night and day throughout the year, but the young stock in their first year of life are allowed out of the byres only on warm, sunny days in the winter and are always housed indoors at night during that period of the year. Although animals in the fields on winter days may get a bite of grass, it is necessary to resort to hand feeding during this time. The winter maintenance ration consists of hay and roots, the production ration of concentrates fed in accordance with the individual milk yields of the cows.

Breeds of Cattle.—Owing to its close proximity to England, Ireland has built up an extensive export trade in store cattle which has encouraged the development of a dual purpose breed combining relatively high milk yield with desirable beef characteristics. More than 90 per cent. of the dairy cows belong to the dairy shorthorn breed, next in importance coming the Kerry breed, native cows, small, hardy, and especially well suited to some of the rougher parts of the country. The beef breeds are represented very largely by Aberdeen Angus and Herefords. The total cow population is about 1,500,000—about 1,000,000 calves are born yearly, of which about 250,000 are required for herd maintenance purposes, while the remainder are reared on the farms until they reach one to two years of age before disposal in the manner referred to later on. The average yearly milk yield per cow is about 485 gallons, though cows producing 1,600 gallons annually were shown to me on certain farms. Twice a day milking is the rule, though I was informed on the farms visited that any cows giving over 5 gallons daily are milked thrice. The herds are much smaller in size than Australian herds, the average numbers milked probably being from fifteen to twenty cows.

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* Mr. Rice returned recently from a course of instruction at the Dairy Research Institute, Reading, England, and this article is a record of some of his impressions of a visit to Ireland.

The economics of the industry have led almost entirely to summer milk production, as in our own State, practically no attempt being made to regulate the calving times of the cows. This contrasts distinctly with dairying in England, where more than 80 per cent. of the milk produced is sold for the liquid milk market. The consequent higher prices obtaining and the need to keep production as uniform as possible throughout the year to meet requirements, are incentives for English farmers to regulate calving times. The age at which the heifers are calved down is two and a-half years, seldom over two and three-quarter years.

Plate 160.
The Head of a Shorthorn Herd on a stock farm in Ireland.

In Ireland the cows mostly calve in the spring. It is customary for the farmers to rear the female calves, subsequently selling in England or Scotland as yearlings or two-year-olds any heifers not required for replenishing their herds; on the smaller farms the heifers are as a rule sold as yearlings, while on the larger farms or where rough grazing is available it is more profitable to keep them until they are two years old. Heifers not purchased by English farmers and not utilised for herd replacement are fattened locally and sold for beef at about two and a-half years of age. Bulls with the best ancestry are retained for breeding purposes, the others being exported as stores to England, where they are fattened. Before any bull can be retained for breeding purposes it must be licensed, as the keeping of "scrub" bulls has been prohibited since 1925. Upon application being made for a license, the live stock inspector examines the animal at six months of age. To be approved it must be true to breed, and although half-breeds are passed at the present time it is anticipated that within a few years only pure-bred animals will be approved.

Plate 161.
A fine representative of the Kerry Breed.

Plate 162.
A Kerry Cow.

To indicate the relative importance of cattle raising to the country, I give hereunder a table showing the values of some of the important agricultural exports in 1935:—

	£
Store bullocks and cows	2,000,000
Calves	35,000
Milch cows	483,000
Springers	167,000
Store heifers	900,000
Other fat heifers	173,000
Fat cows	173,000
Total value of cattle exported in 1935	5,500,000
Sheep	357,000
Pigs	428,000
Pig products (bacon)	1,500,000
Fresh pork and hams	400,000
Butter	1,658,000
Cream	112,000
Cheese	18,000
Eggs	1,000,000
Horses	1,000,000

Pig raising forms an important and ideal combination with dairying owing to the abundant supplies of skim milk which are returned to the farmers by the creameries and separating stations. The foregoing table shows that the value of pigs and pig products exported in 1935 amounted to £2,500,000. The Irish Large White is practically the only breed met with throughout the country.

Rye grass is the predominant constituent of pasture grass mixtures. In fact at several experimental farms visited it was observed that there is a tendency to depart from complex pasture mixtures and to substitute a simple rye grass-clover mixture. For permanent pastures, a seeds mixture advocated by the Agricultural Department for practically all dairying districts is:—

15 lb. perennial rye grass,
7 lb. Italian rye grass,
4 lb. meadow fescue,
3 lb. Timothy,
3 lb. Cocksfoot,
4 lb. Red clover,
2 lb. Alsike clover,
2 lb. White clover.

Cabbages, mangolds, turnips, swedes, and kale are grown extensively to provide succulence in the winter ration. Sugar beet is grown fairly extensively in districts close to the sugar beet factories, the tops and factory by-products being relished by stock.

The growing of catch crops between two regular crops in the rotation, because of its advantage in providing green fodder at a time of scarcity of grass and thus saving the purchase of feeding stuffs, is fairly widely practised in the dairying districts. As an example, at one farm visited vetches, beans, winter oats, and wheat were sown together in September (autumn) to provide fodder in April and May (spring and early summer).

Schemes for Improvement of Dairying.

The following schemes, full particulars of which have been obtained by me, are designed to promote better efficiency in the dairy industry of the Irish Free State.

1. Scheme for the registration of purebred dairy cattle. The object of this scheme is to raise the standard of pure-bred herds.
2. A scheme for the registration of non-pedigree dairy cattle aims at encouraging the grading-up of such stock.
3. Scheme for encouraging improvement in the breeds of cattle.
4. Loans for the purchase of premium bulls.

The two lastmentioned schemes, it is hoped, will stimulate improvement in cattle breeding mainly by inducing farmers to keep suitable bulls of a high degree of excellence. Loans may be granted to approved applicants with limited capital who desire to purchase a bull.

Creamery Butter Manufacture.

There is one great fundamental difference between the systems of butter manufacture in Australia and Ireland. Whereas in Australia the milk is separated on the producing farm, allowed to ripen spontaneously, and delivered to the factory by cream carriers who pick up all cream on a defined route, the Irish farmer takes the whole milk to the creamery (factory) or separating station daily and has the separated milk returned to him on the following day. This system gives a sweet cream butter as against the Australian ripened cream, neutralised product. Again, unlike the Danish method, the use of starter for ripening the cream at the creamery to produce an acid, full-flavoured butter is not practised in Ireland.

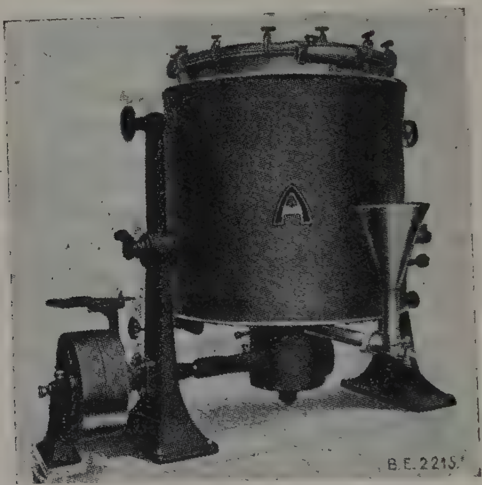
Large quantities of butter are placed in cold storage during the period of peak production to meet winter requirements, when butter manufacture declines sharply owing to the diversion of milk for city requirements. The Irish Butter Testing Station has had considerable success in using determinations of the pH value (a measure of degree of acidity) for selecting butter which will maintain its quality in cold storage. It is now also recognised that the pH value, combined with the action of small traces of copper and iron contamination, may be a potent factor in the deterioration which sometimes occurs in Australian butter during the voyage to England. Occasional samples of degraded butter obtained by me from Tooley street and examined at the National Institute for Research in Dairying have shown the importance of controlling acidity and metallic contamination.

The creameries are on the whole rather smaller than Australian butter factories, the larger plants being capable of producing about 20 tons of butter weekly.

Each central creamery, besides purchasing milk from farmers in its own neighbourhood, is also surrounded by a number of auxiliary creameries or separating stations, which receive milk from their own suppliers, separate the cream therefrom, pasteurise and cool it, and forward the pasteurised cream to the central creamery for churning. Few of these separating stations are equipped with facilities for brine-cooling of

the pasteurised cream, so that in summer it is only possible by water cooling to reduce the temperature of the cream to about 56-60 deg. F. As probably five hours elapse before the cream reaches the central creamery to be thoroughly cooled, much difficulty arises in producing a butter of firm texture in the warmer months.

Payment for milk is based on the butter-fat content, the Gerber test being used for fat determination. The Babcock test so widely employed in Australia and America is replaced in all European countries by the Gerber test. The present price for butter-fat is 1s. 2d. per lb. Daily samples of each supplier's milk are taken, placed in composite sample bottles containing preservative, and the fat analyses made fortnightly on the composite sample. There is no price differential for quality of milk as measured by the methylene blue-reductase or other



[*From "The Butter Industry" (Otto F. Hunziker*).

Plate 163.

Flash Pasteurizer, Astra type "U."

tests, nor are these tests applied with a view to effecting improvement in the quality of the milk supply. Nevertheless, on account of daily delivery (including Sundays) of milk, the mild climatic conditions, and pasteurisaton of the milk before bacterial spoilage shows up, the quality of the butter is uniformly good.

The separated milk returned to the farmers is not pasteurised, there being no legal regulation compelling it to be submitted to this treatment. This is in distinct contrast to Denmark, where, with a view to combating the spread of tuberculosis amongst live stock, regulations relating to the compulsory pasteurisation of skim milk returned to farmers by creameries have been strictly enforced for many years.

A brief outline of the method of butter manufacture is as follows. The milk upon arrival at the creamery is sampled, weighed, and tipped into a vat. Neutralisation, essential in the processing of ripened cream in Australia, is unnecessary in the manufacture of sweet cream butter, so that the milk is pumped straight from the tipping vats through a

preheater whereby its temperature is raised to about 110-120 deg. F. before it is passed through the separator. However, there seems to be wide variations in separating temperatures—some factories apparently separate the milk without prewarming it at all in the summer weather, but warm it up to 70 deg. F. prior to separation in the colder weather. After separation the skim milk is pumped to special tanks located outside the factory, while the cream is immediately flash pasteurised at temperatures varying from 190-200 deg. F. The pasteurisers used are of the closed type, like the Astra, the dome-type machine, so frequently found in Australia, not being used in Ireland. The cream after the heat treatment, passes first over water-cooled tubular or conical surface coolers and then over brine-circulating tubular surface coolers to reduce the temperature to 38-40 deg. F. If required, further cooling to 34-38 deg. F. is effected by means of brine-circulating swing-coil coolers in the holding vats themselves. After being held overnight in the attemperating vats, the cream rises 2-4 deg. F. in temperature in the warmer weather and is churned at temperatures varying from 38-42 deg. F.

Wet parchment is used for lining the boxes, sufficient for a week's requirements being boiled in a saturated brine solution and allowed to soak in the solution until used. This prevents mould contamination of the butter after package.

A typical example of the marking of the boxes is illustrated below:—

IRISH FREE STATE

X5 CREAMERY

BUTTER

MADE BY

KILMALLOCK Co-operative Creamery Ltd.

Kilmallock, Co. Limerick.

Registered No. C 332

Plate 164.

Each box must bear in the left-hand corner of the marked side a letter to indicate the month of manufacture and a figure or figures to denote the serial churning number of the month. The registered number of the creamery must also appear.

Condensed Milk.

Partially condensed skim milk and whole milk are also produced at several of the creameries, the milk being reduced to about 9·5 per cent. fat content. This product is then despatched in churns (cans) to a large condensery at Limerick, which further condenses the product, sweetens it, if necessary, and is equipped with the necessary machinery for canning the milk.

Butter Grading.

A few comments on the official system of butter grading may be of interest. All butter exported has to be graded at the outgoing port. The Dairy Produce Act stipulates that the butter must not be over 52 deg. F. at the time of shipment. It is usual for the boats to load butter on a set day each week at the ports, and three inspectors visit each port weekly to grade all butter awaiting export. Each inspector independently examines a box from each churning and, when all grading is completed, the individual inspector's scores are compared. Should there be any disagreement in the scoring, the affected butter is jointly re-examined before its grade is finally decided upon. The grading points, which differ somewhat from the Australian system, are:—

Flavour	60
Body and texture	30
Colour	5
Packing	5

Surprise Competitions.

In addition to the grading of all butter exported, every creamery is visited periodically by the inspector for the district, who selects at random a box of butter in stock and forwards it to the Irish Butter Testing Station in Dublin. The boxes are held there for about ten days at 40 deg. F., and then scored. Before grading all distinguishing marks are covered and each box is numbered. As with export butter, the inspectors independently grade each box of butter, and when their cards are handed in, if there is any disagreement in the score of any particular box, this butter is jointly re-examined. The method of working is for the first inspector to start with the first box, the second with the eighth box, and the third with the fifteenth box. The results of the first scoring are averaged for the purpose of the competition. This system has much to commend itself by enabling actual scorings for flavour and other properties of the butter to be correlated with the findings of any scientific investigation being carried out. The creameries are informed of the marks awarded, and any comments made by the judges and the boxes are returned so that they may also examine the butter, knowing the marks awarded and the condition in which it would normally reach the consumer.

At the actual time of grading, samples of the butter are taken for bacteriological and chemical examination. The managers are also advised of the results of these tests, so that they will know the moisture and salt content of the butter, the degree of cleanliness exercised in manufacture, and the freshness of the cream used for making the butter.

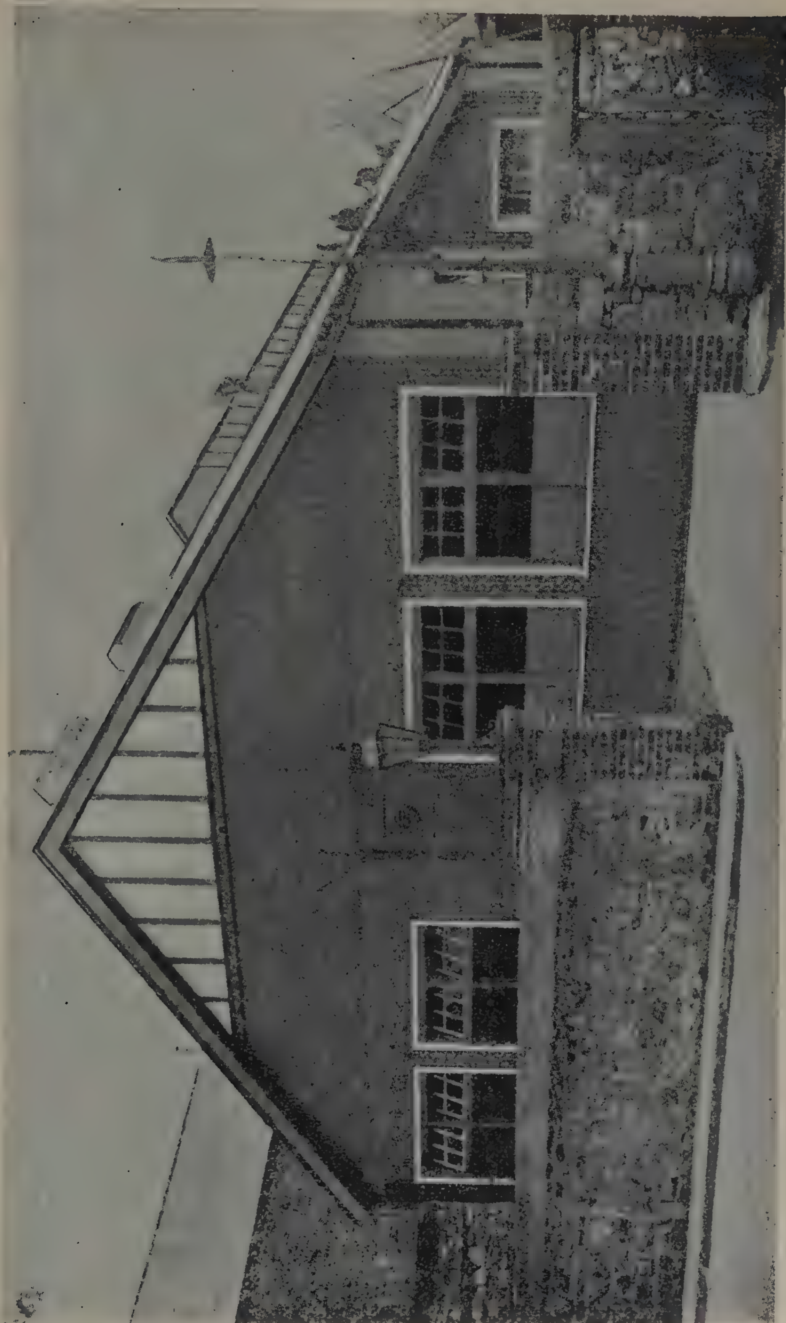


Plate 165.
The Butter Testing Station, Dublin.

Based on the results obtained in the surprise competitions, a cup is awarded annually to the creamery manufacturing the highest quality butter, and medals are given to the manager and the head butter-maker.

The Irish Butter Testing Station.

It is the function of this station to make the regular chemical and bacteriological examinations required in connection with the surprise competitions, to afford technical advice concerning manufacturing problems, to carry out analytical and biological tests on various materials used in the dairy industry, and any other special scientific investigations.

The routine work done at this station includes:—

1. Determination of moisture on samples of butter taken by inspectors at the shipping ports to see that the maximum legal moisture content of 16 per cent. is not exceeded.
2. Systematic bacteriological and chemical examinations of creamery and separating station water supplies with the object of ascertaining their suitability for use in the manufacture of dairy products.
3. Regular bacteriological examination of samples of cream taken by inspectors at creameries to check the efficiency of pasteurisation, the sanitary conditions of manufacture, and the cleanliness of the milk supply.
4. Bacteriological control of starters used in cheese factories.
5. Miscellaneous bacteriological and chemical analyses, such as (*a*) fat content of cream samples; (*b*) cheese; (*c*) milk products like milk powder, malted milk, &c.; (*d*) vegetable parchment; (*e*) salt.

Research Work Relating to the Dairy Industry.

Various institutions in the Irish Free State have made important contributions to dairy science. Arising from the investigations at the Butter Testing Station, the pH value was adopted to determine the suitability of butter to maintain its quality in cold storage. Another study has revealed that wide variations occur in the rate of growth of micro-organisms in Irish butter when submitted to ordinary temperatures. It is now known from work done in various parts of the world that a major factor governing the rate of bacterial proliferation in butter is the state in which the moisture exists, the bacteria present in butter in which free moisture or large droplets are present, due to insufficient working, multiplying with greater rapidity than is the case in well-worked butter, in which the moisture is thoroughly dispersed.

Irish butter is made from unneutralised, sweet cream, and it has been shown that the flavour score is closely correlated with the pH of the butter—that is, the degree of acidity. Increase in acidity (low pH) generally gives butter of lower grade than when the pH is from 6·7 to 7·0. Investigations have also been carried out to test bacteriologically and chemically the effect of cold storage on the keeping quality of butter and on the analysis and composition of vegetable parchment used for packing dairy products.

Studies at the Animal Nutrition Department, University College, Dublin, have dealt with mineral metabolism in the calf and the effect of the addition of inorganic materials to calf's diet. In experiments on the

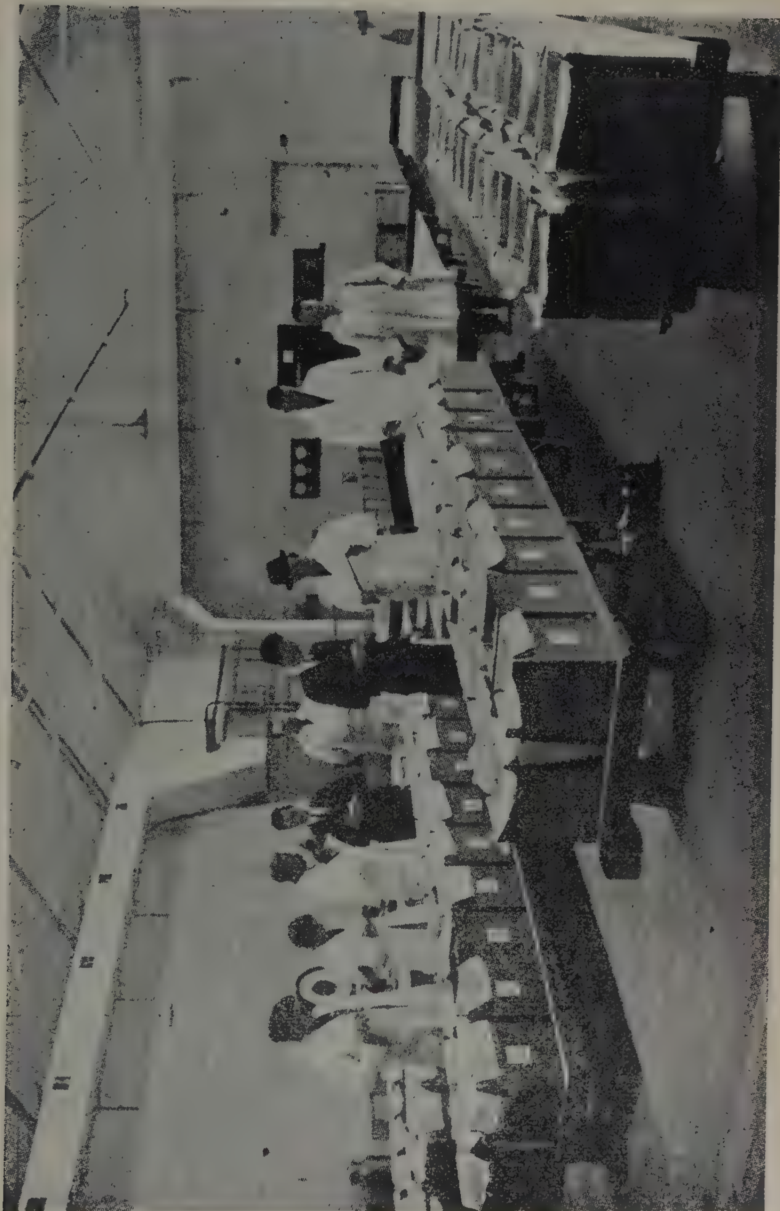


Plate 166.
Grading Butter for a "Surprise Competition."

effect of codliver oil feeding on the calcium and phosphorous content of cow's milk, it was noticed that there was no effect on the calcium or phosphorous content of the milk, but the percentage of fat in the milk was seriously depressed, a fact which has been observed by several other investigators. Other experiments were designed to show the effect on the fat content of milk by feeding various materials. Neither the amount of water consumed with the ration nor the succulence of the foods is capable of affecting the richness of milk in butter-fat. Although a sudden change from a high to a lower level of feeding may or may not reduce the milk yield, the proportion of fat in the milk remains constant. Conversely, changing from a low level of feeding to an abundant ration may increase the milk yield, but is without influence on the fat percentage.

A number of important investigations connected with butter manufacture have been carried out in recent years at the Dairy Technology Department, University College, Cork.

Dairy Education.

The Faculty of Dairy Science, University College, Cork, undertakes the technical training of youths desirous of qualifying for employment in creamery work. Each year applications are invited from prospective candidates, who are selected on the results of a written examination and personal interview by the Dean of the Faculty. Previous creamery experience is not a prerequisite for admission to the course, the students being chosen on their apparent suitability for employment in the industry. The number of students is limited to fourteen each year, this number being regarded as sufficient to fill available openings. The duration of the course for the Diploma in Dairy Science is two years, and since 1925 the possession of the certificate granted to students who complete the course and who have had sufficient practical experience, certified by a Departmental Inspector of Dairy Produce, is the recognised qualification for employment as a creamery manager.

A limited number of students also study a four years' course for the degree of Bachelor of Dairy Science. The Department does not undertake to find employment for anyone completing the course, but graduates are usually absorbed in the Agricultural Department, or as teachers in State or private colleges.

The College creamery which purchases cream from co-operatively-owned separating stations, is conducted exactly like any commercial creamery, and students are also sent to co-operative creameries for practical experience. There are also well-equipped bacteriological and chemical laboratories.

In addition to the training of students, much investigational work having an important bearing on the technical problems of the industry has been carried out by members of the staff in recent years.

Rather unique is the Munster Institute, on the outskirts of Cork, a residential college for young ladies, which provides courses of instruction in poultry-keeping, farm butter-making and dairy practice, such as care of cows, calves and pigs, and domestic economy. The primary purpose of the institute is to fit young women to perform the duties devolving upon them in ordinary farm life. Students who show special aptitude are, however, afforded further training to qualify for appointments under County Committees of Agriculture.

This institute has a tuberculin tested herd of dairy shorthorn cows, the average milk yield being 700 gallons per cow. The area of the farm is 160 acres and 140 head of dairy stock and 100 pigs are kept. The property being overstocked, it is the policy to break up the temporary pasture—Italian ryegrass and red clover—every two years and renew it.

Acknowledgment.

Grateful thanks are due to all those with whom I came into contact during my visit for their ready response to my inquiries, and for the full information afforded me; in particular, I should like to mention Mr. T. O'Connell, Chief Inspector, Department of Agriculture; Professor Boyle, University College, Cork; Dr. Arup and Dr. Gilmour, Irish Butter Testing Station; and Dr. Hennerty, Dairy Produce Inspector.

A COMMON WINTER DEFECT IN MILK AND CREAM.

Now that cooler weather is approaching, a flavour defect which is likely to be a frequent cause of trouble in milk and cream is tallowiness —a defect which, depending upon its intensity and stage of development, is usually described as metallic, oxidised, oily, mealy, cardboard, and "cappy" taint. Although tallowy and related flavours may be brought about by other influences, they are usually traced to the exposure of milk products to metallic contamination, notably copper from factory appliances and iron from dairy farm equipment.

The more common occurrence of these faults in winter depends upon the ability of minute traces of metals in solution in milk and cream to accelerate chemical changes between the oxygen normally present in these liquids and a certain constituent of butter-fat, with the formation of compounds which impart the characteristic flavours. Such low concentrations as 0·2 part per million of copper and 1·5 parts per million of iron will impart an objectionable taint. In summer, when microbial development is most active in milk, the dissolved oxygen is rapidly used up by the organisms for their own growth, and so they actually help to prevent the onset of tallowiness. Their action in this single instance in retarding rather than promoting the deterioration of milk and cream is in striking contrast with their usual behaviour, as they are responsible for almost all the major faults which occur in milk products.

The most up-to-date factory processing is quite unable to renovate tallowy cream, which, therefore, is always classed as second or pastry grade. Dairy farmers should look over all metal utensils with which milk comes into contact, and any from which the tin coating has worn off, or which show signs of rusty patches, should be retinned if their condition warrants the expense. Any piece of equipment which is too old or in a state of disrepair which does not justify the cost of retinning should be immediately dumped. The continued use of such unsatisfactory utensils during the winter months will almost certainly mean degraded cream and substantial monetary loss.

—*E. B. Rice.*

A Note on Fodder Crop Experiments at Meringa Station.*

THE provision of suitable fodder for farm animals constitutes an ever-present problem for the cane grower, outside the crushing season and also towards the end of the season, when chop chop is scarce as a result of a large proportion of the cane crop being burnt prior to harvesting. Some growers try to provide off-season fodder by allowing their old ratoons to volunteer until sufficient cane and top is produced for chop chop purposes, after which the old stools are hurriedly ploughed out and the block replanted. This practice has many disadvantages inasmuch as diseases may be carried over to infect the next year's crop; pests are subjected to little or no check, and the growth of a green manure crop is prevented. These facts have impressed us with the desirability of farmers setting aside a small acreage for the growing of fodder crops and it was deemed desirable to initiate some experiments along these lines at the Meringa Station.

Plate 167.

Soybean, variety Otootan, eight weeks after sowing. The soybeans were sown in drills 3 feet apart and 6 inches deep, but only a light covering of soil was given. (Note:—The row of soybean to the right is of another variety.)

Considerations of disease control decree that there should not be grown on a cane farm any crops which are closely related to sugar cane and which might act as hosts and sources of infection of diseases of sugar cane, or the insects which spread them. For this reason therefore, maize and sorghums should be excluded. Our experimental programme is only in its infancy, but it is thought that even the very early results may be of interest to farmers.

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* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for April.

Trial sowings have been made with panicums and digitarias (obtained through the courtesy of the Bureau of Tropical Agriculture), soybeans, lespedezas and clovers. To date none of the tested varieties of lespedeza and clover have performed satisfactorily. Soybeans, especially the variety Otootan, show some promise, and selected varieties will be given further trial with monthly plantings. In Plate 167 is reproduced a photograph of the variety Otootan taken eight weeks after sowing; the crop was then some 2 feet 6 inches to 3 feet high and still making growth. This particular variety is widely used overseas for hay production; the other varieties are not so vigorous but are worth consideration as seed producers.

Plate 168.

Panicum coloratum ready for harvest. This grass was grown from seed planted in very shallow drills some 3 feet apart.

Two digitarias (valida and Pole-Evansii) were planted from root clumps. These grasses send out runners which take root and later form a continuous mat of grass. Under Meringa conditions valida appears superior to Pole-Evansii, but neither grew well during the dry spring weather; their stems became hard and were difficult to chaff. Both have rather thin coverage and allow the growth of other grasses and weeds. In addition the type of rooting might be such as to cause trouble in subsequent cultivation of other crops and they may possibly prove better for grazing than for hay purposes.

Panicums comprised *Panicum coloratum*, *Panicum maximum* (fine stemmed Guinea grass, and *Echinochloa crus-galli* (white panicum). The fine stemmed guinea grass is reputed to have made good growth at South Johnstone, but owing to the small amount of roots available it has been necessary continuously to subdivide our stocks for further propagation. Consequently we are unable to furnish much information

regarding its growth and palatability. However, its reputation is good and it is being extensively propagated on the Tableland and the Daintree.

Coloratum is reputed to give rather indifferent germination but our first sowing (under irrigated conditions) gave excellent results in August; midsummer sowings under natural rainfall conditions did not germinate nearly so well and some portions had to be re-seeded. This grass did well under average rainfall conditions, and horses readily eat it. The first cutting (see Plate 168) was made on 20th December, and in

Plate 169.

White Panicum, seven to eight weeks old. Seed sown in very shallow drills 3 feet apart.

a month's time the ratoons had grown to a height of 2 feet 9 inches and commenced to flower again. A second cutting of a portion was then made, but heavy rains fell immediately afterwards and grass clumps rotted badly and ratoons came away sparsely. The remaining portion of the plot received the second cutting about a week later, but on this occasion it was cut higher (about 9 inches from the ground) and the ratooning greatly improved. Additional plots of this grass, planted towards the end of December, commenced to flower in mid-February.

White panicum is a very promising grass under Meringa conditions. Its rapid growth, high fodder value, and the readiness with which stock will eat it strongly suggest that it should be a valuable summer fodder crop for North Queensland coastal conditions. The seed germinated well, the young plants quickly became established and choked out any foreign weeds. One crop, planted towards the end of December, grew 4 feet to 4 feet 6 inches in seven to eight weeks (see Plate 169). It is a prolific seeder and if the crop is not cut before the seeds mature they will germinate later and possibly compete seriously with other crops (if any) later planted on the same land.

WINDBREAKS AND SHELTER TREES ON THE DARLING DOWNS.

For the comfort of stock in cold weather windbreaks are a necessity, especially on open plain or high tableland country. In timbered country, provision should be made for windbreaks when the land is being cleared, by leaving suitable stands of the original forest covering. Otherwise, the expense of establishing shelter belts will have to be incurred later on. Meanwhile, stock will have to suffer all the discomfort caused by winter's frigid westerlies, which blow usually for days on end.

In country which has already been cleared the planting of suitable trees on the prevailing windward boundaries of farms on tablelands, plains, and undulating country is, therefore, worth serious consideration. If edible trees are planted they might be used in times of drought. A farmer would naturally hesitate before destroying shelter trees for feeding purposes, but, if the necessity arises, edible trees may be lopped without destroying them.

The undermentioned trees are mainly suitable for planting on the Darling Downs. Edible types are the kurrajong, bottle tree, Portuguese elm, honey locust, and carob bean. Less palatable trees are the cypress (*Cupressus torulosa*), *Pinus radiata*—commonly known as *Pinus insignis*—white cedar, and *Bauhinia hookeri*. The well-known and admirable western tree, the wilga, should be added to this list if it is available in the local forests. Although there is a considerable amount of variation in the palatability of individual trees, the wilga is both a useful and extremely ornamental species.

In most cases the trees mentioned can be purchased from nurserymen. In the event of expense proving an obstacle to adequate planting, the trees can be raised from seed in an improvised nursery on the farm. The seeds could be germinated in shallow boxes or tins about twelve months before the young trees are required for planting. In frost-free areas June, July, and August are suitable months for planting out the young trees in their permanent locations. Some protection must, however, be given to the plants in frost-susceptible districts if midwinter planting is attempted.

Protecting the young trees from stock is most important. If the trees are planted near a boundary fence, it might be found most convenient to erect a second inner fence to keep stock away from the trees until they are high enough to be out of reach. Smaller farm stock, such as sheep, can be let into the enclosure once the trees have attained sufficient height for their foliage to be above the reach of the animals.

—*W. D. Francis.*

Cattle Fattening on Coastal Pastures.

OBJECTS AND RESULTS OF TULLY EXPERIMENTS.

F. W. BULCOCK, Minister for Agriculture and Stock.

MUCH has been written and said about the possibility of satisfactorily fattening cattle on the far northern coast, and opinion has ranged from enthusiastic support to utter condemnation. In the early stages all opinions were based on theory and were therefore of little value, but realising that the project was worthy of test and trial, an organisation, both practical and scientific, was built up, with instructions to investigate all possible avenues of research.

Naturally, because he was the pioneer of the project, the property of Mr. Brice Henry at Tully was chosen for the research work, and I propose to tell the story of this enterprise from its visionary dawn up to the present.

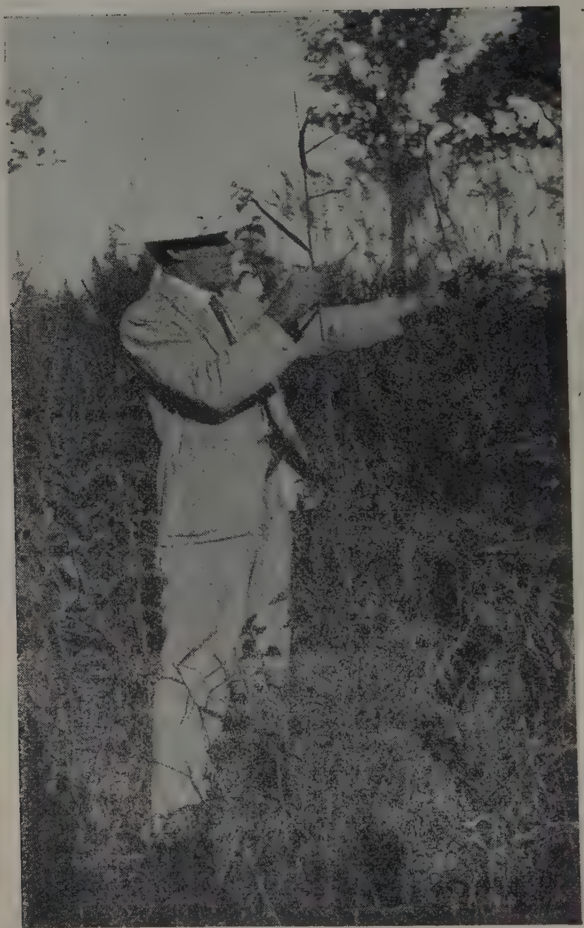


Plate 170.
Molasses grass, showing height of growth.

In order to present a complete picture it will be necessary to indicate just for what we were striving. In order to do this, a few words of explanation will be necessary. In the old days we had a frozen beef trade, which was of more importance to Queensland than to any other State in the Commonwealth.

Then came chilling of beef and the rapid contraction of the frozen beef market. Experiment and research followed, and a system was evolved under which Queensland found it possible to export beef in the chilled state. Having overcome all the difficulties associated with this venture, we placed chilled beef on the English market. Then followed comparisons with the product of our chief competitor, the Argentine.

Plate 171.
One of the fattening paddocks, showing growth of Para grass.

That the Queensland beef suffered by these comparisons is well known. Argentine supplied a young, well-bred carcase of good appearance and finish. Queensland, generally speaking, supplied an older carcase of less attractive appearance. Bearing in mind that Queensland's trade depends, in the last analysis, on the goodwill of the housewife, a judicious purchaser, the question of how to raise our carcase standards to Argentine levels immediately forced itself upon us. Argentine finishes its export cattle by topping up on artificial pastures in favoured localities. The question was: Could we do the same, and, if so, where could we bring any portion of our export chilled beef appreciably closer to Argentine standards? Hence the work at Tully was undertaken.

The Chosen Grasses.

Mr. Brice Henry of the Tully had a vision sufficiently strong to induce him to back it to the tune of many thousands of pounds.

Scrub, forest, and open lands were cleared and prepared for artificial grasses. Here was the first problem: What grasses should be planted? Discerning eyes were cast over the North and Para grass (*Panicum muticum*), Guinea grass, and Molasses grass were selected. Anxious observers watched the development of these grasses and their reaction to grazing. Pessimists said, "They'll never stand up to heavy grazing," or "They'll be choked out by the comparatively worthless native grasses."

Plate 172.
Bullocks in process of fattening.

At length, however, the grasses appeared to be established. The absence of a legume in the pastures constituted a source of worry, but the stage was set for the real test. Accordingly, a veterinary surgeon was sent from Brisbane to Cloncurry to assist in the selection and inoculation of the first draft of cattle it was proposed should be placed in the pastures. This initial step, simple as it may appear, was again attended with difficulty. Two bleeders were reared at the Animal Health Station at Yeerongpilly.

These animals were reservoirs for the organism that causes tick fever, and their blood had to be injected into the Gulf cattle to protect them against the dreaded "redwater." Pleuro-pneumonia risks had also to be attended to by inoculation, and at length the first draft, 100 strong, left the Gulf for the artificial pastures of the Tully.

Veterinary and agricultural services had now to be concentrated on the cattle and the pastures, and probably no experiment of modern times attracted such attention as this Tully venture.

Shortly after the Gulf cattle were turned on to the introduced pastures, Dr. Bull (Chief of the Animal Husbandry Section of the Council for Scientific and Industrial Research), Dr. Turner (for the same organisation), Professor Seddon (Dean of the Faculty of Veterinary Science at our University), Professor Goddard (Officer in Charge of Research Co-ordination), Mr. Wilson (Acting Under Secretary of the Department of Agriculture and Stock), and veterinary and agricultural officers in North Queensland met at Tully.

We inspected the cattle. To all of us they appeared to be thriving. The grasses claimed our attention. They were not only satisfactorily established, but were choking out the natural grasses. One felt that here was the spearhead of our attack on the United Kingdom markets; that here, in a small experimental way, a new development of national importance not only to the cattle industry, but to the State, was taking place. But conviction was not proof.

I gave instructions for a consignment of the cattle to be forwarded to Brisbane abattoir for slaughter and observation. The cattle arrived here and certainly did not please many observers. They were hollow, and on arrival certainly did not look "the goods." We held them for a week giving them lucerne hay at a cost of 1s. per head and bought half the consignment in on abattoir accounts.

On slaughter a great surprise awaited us. All the cattle killed out a great deal better than appearance would suggest. Subsequent observation has shown that Para-fed cattle always look better on the hook than on the hoof.

Tully Cattle Topped Market.

We then shipped the consignment to the United Kingdom, and arranged for special reports. The contents of these reports can be gauged by the fact that realisations were higher for this small shipment than for any sold that week. In other words, our Tully cattle topped the market.

But the very success of the work indicated how necessary it was to experiment further. Although the year's work had proved satisfactory, it had left many questions of an urgent nature unanswered. The work of the investigations had to be directed towards finding an answer to certain qutstions.

Broadly speaking, these questions were—

(*a*) Was there a nutrition deficiency in the pasture that could be bridged by the use of licks?

(*b*) The influence of breeding on fattening.

(*c*) The best way in which fully to conserve and utilise the pastures.

(*d*) Could production be directed towards flattening out the export peak period?

Plate 173.

Some of the Camboon bullocks on arrival at Brisbane after the thousand-mile journey from the Tully, North Queensland.

Plate 174.

One of the bullocks on arrival at Brisbane after a rail journey of a thousand miles.

It was to find an answer to these questions that last year's research programme was framed. Let me endeavour to indicate to what extent these questions have been answered.

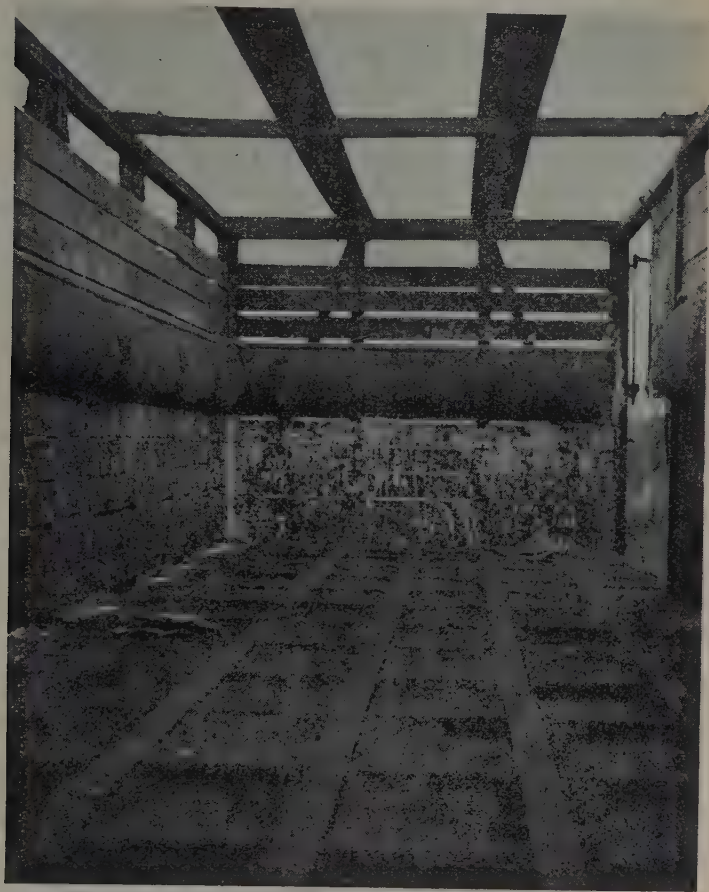


Plate 175.
Interior of railway cattle truck specially padded.

Licks and Breeding.

During the past season licks, consisting of salt and bonemeal in varying proportions, were tested. The cattle developed a decided preference for a lick of one part salt to three parts bone meal, and the use of this was certainly justified. This lick, once determined, was kept constantly supplied, but the consumption was not great.

Next came the importance of breeding in relation to fattening, and in order to obtain reliable data a truck of well-bred Herefords was secured from Camboon. As chillers they proved the necessity of obtaining well-bred stock, and certainly did prove that the better the breeding the more chance there is of success. It was difficult to secure the right type of beast in the North, as many that were available were definitely larger framed than is desirable in animals that are to supply well-fattened carcases of 630 to 650 lb.

This question of breeding certainly does present a major problem, but I am of opinion that types will improve as the economic necessity for such improvement manifests itself.

The question that concerns itself with pasture management obviously is a complex one, to which the key is rotational grazing. In this direction very valuable data were obtained. It is generally believed that the best grazing results are obtained when pastures are kept down to about 6 inches high. But sound as this general rule may be, it certainly cannot be applied to Para grass at Tully.

Cattle turned on to such a pasture actually lost weight, but when placed on pastures 18 inches high weight increases were surprisingly good. In fact, on this type of pasture the cattle gained 2 lb. weight per day.

In view of this experience the plan adopted was always to have available pastures of this description. The real test of pasture is, of course, just how they influence growth, and taking four experimental lots, which may be regarded as typical of the whole weight increase, the weight gain over the whole period of the test was a little over 1 lb. per day, the best group showing a gain of 1·4 lb. and the worst a gain of 1·02.

Why the Work Should be Continued.

We now come to what may reasonably be regarded as one of the major reasons why we should continue with this work. This matter concerns the spread of beef exports. It is clear that the United Kingdom will not tolerate our continuing to ship our total yearly allocations during four or five months of the year. A spread of exports is essential if we are not to face real export difficulty. Experience has shown that the older methods cannot possibly give us the necessary spread, but by fattening on artificial grasses that spread can be obtained.

So we come to the conclusion of our second year's experimental and research work and can state certain determinations that have been possible as a result of our observation. These are—

(*a*) That the artificial pastures at Tully and Innisfail will fatten bullocks to first quality chiller grade.

(*b*) That carcases of such animals are well fleshed and have adequate covering.

(*c*) That given suitable pasture management there is no reason why fat stock should not be turned off during any month of the year.

(*d*) For the best results rotational grazing is indicated.

(*e*) Contrary to general belief, cattle do well and make substantial gains during the wet season and when the weather is hottest.

(*f*) Research has shown that pastures of the type described can fatten cattle at three years of age.

These conditions give rise to the belief that cattle fattening on the far northern coast will expand from year to year and play an important part in the development of this territory, where large areas of land exist, eminently suited for this purpose.

Plate 176.

Inspecting carcases of cattle from the Tully pastures—left to right: Mr. F. W. Bulcock, Mr. Brice Henry, Professor E. G. Goddard, Professor H. R. Seddon, Mr. E. F. Sunners, and Dr. M. White.

The cattle from the Tully slaughtered last week in Brisbane graded out: 79·4 per cent. G.A.Q.; 19·1 per cent. F.A.Q.; 1·5 per cent. reject for export owing to a scar from an old wound.

These figures are very encouraging, so encouraging, indeed, that a further programme of research, based largely on economics, is now being devised.

The thanks of the Department are extended to Mr. Brice Henry for his co-operation in these important experiments, and the gratitude of the State is his due for the part he has played in developing a theory to success and in making such a valuable contribution to the welfare of a district, an industry, and a State.

DRYING OFF A DAIRY COW.

This is a problem that often arises with the dairy farmer. The question has recently been under investigation by the University of Minnesota, U.S.A., which studied the following methods, viz.: Incomplete milking, intermittent milking, and complete cessation of milking. Replies from 300 dairy farmers showed that 76 per cent. adopted the intermittent plan, 16 per cent. the complete cessation method, and 8 per cent. the incomplete system. Experiments were then begun on different methods, including a study of the udder at the commencement of the next lactation period, and the rate of milk production. The results were republished with the authority of the Royal Agricultural Society of England. The experimental method adopted was that of milking one half (left or right) of the udder by one method, and ceasing to milk the other half. This plan was based on the knowledge that the left and right halves of the udder are independent of each other. The results of the experiment, using eighteen cows, show that complete cessation of milking can safely be recommended as a method for drying off cows producing up to 20 lb. of milk daily, and that the drying off process will be accomplished more quickly than by the incomplete, or intermittent, milking. When milking is discontinued the udder will fill up until a pressure great enough to stop secretion is caused in the milk gland; after secretion is stopped the milk is gradually resorbed from the gland until it becomes dry. On this basis it is a mistake to milk out a cow during the resorption period, as this releases the pressure within the gland, secretion is again encouraged, and the drying off period prolonged. No significant difference was noted in the quantity of milk either as a whole, or from the different halves of the udder, in the lactations following the drying off of the cows by the three methods used.

Further study of the subject indicates that drying off by complete cessation of milking had no marked effect on the bacterial content of milk obtained in the subsequent lactation period.

—*The Australian Dairy Review.*

RADIO SERVICE FOR FARMERS.

From National Station 4QG (or 4QR) (Relayed to 4RK Central Regional and 4QN North Regional).

Arrangements have been made with the Australian Broadcasting Commission (Queensland) for the regular delivery, in interesting dialogue form, of talks to farmers by officers of the Department of Agriculture and Stock during the

COUNTRYMAN'S SESSION 4QG (or 4QR) EVERY SUNDAY MORNING,

Beginning at 9.10 a.m.

Pink Eye in Sheep.

ROSS NOTT, B.V.Sc.

"PINK EYE," or infectious ophthalmia, has been known for many years in Australia, and though the mortality is very slight, deaths may and do occur in drought or semi-drought areas where, owing to blindness, sheep are unable to get to water.

A great deal of trouble follows outbreaks in travelling mobs of sheep or during mustering for shearing, &c., for the disease is then very difficult to check.

Material from the infected eye of a sheep transferred to the healthy eye of another sheep reproduces the disease and healthy sheep grazing on tall pasture (for instance, most seeding grasses, &c.) and running with infected sheep may also suffer. If, however, the grass is kept well cropped down, the liability to infection is considerably reduced. It is presumed, therefore, that, in the field, "pink eye" is not transmitted from sheep to sheep by direct contact, but by the material from the infected eyes being brushed off by the grasses, &c., and thus conveyed to the eyes of healthy sheep. Flies also may play a part in spreading the disease.

An attack of the disease appears to convey an immunity, but if only one eye of the sheep is affected, this is the only eye which possesses the immunity.

It is also known that the exudate from the eye becomes non-infective after drying for a short period. Thus, in fine weather, healthy sheep can be turned into previously infected paddocks or driven over stock routes without risk twenty-four to forty-eight hours after infected sheep have been moved out of these places. There is also some evidence to show that any injury to the eyes through dust, grass seeds, &c., increases the liability to infection.

The symptoms can be divided into three stages which ordinarily follow one another, although it is quite common for the trouble to clear up at the second stage and not proceed to the final stage of ulceration.

The first stage is characterised by a discharge from one or both eyes, and on examination the membrane surrounding the eye is found to be inflamed and the eyelids swollen. These symptoms are followed by the second stage, in which the front of the eyeball becomes smoky or opaque. A scum is gradually formed through which small branching blood vessels may be seen and a varying amount of pus is present in the corner of the eye.

By this time the sheep is quite blind in the affected eye, and shows signs of acute pain, while the least sound will disturb the animal, causing it to rush blindly in any direction with its head held high, progress being stopped only by violent contact with a fence or some such object.

The third stage, which is not seen in all affected sheep, is one of ulcer formation in the front of the eye. Sometimes the ulcers appear to burst, and the eye becomes practically covered in pus.

Many cases, however, do not go as far as this, and even if left untreated the animal may recover with little or no loss of sight, although complete recovery probably takes a month or even longer.

As in many other diseases of sheep, treatment depends on the facilities for handling the sick animals. All affected sheep should be at once isolated and cut up into small hospital mobs held in small shady paddocks, handy to water, where they can be supervised easily.

A few drops of a 2 per cent. solution of zinc sulphate in water, made by dissolving 1 oz. zinc sulphate in 1 quart of water, should be dropped into the affected eyes by means of a shearer's oilcan. All pus and other matter is wiped from the eyes by means of cotton wool soaked in the same solution.

This treatment should be carried out as frequently as possible, and usually the disease will clear up after about a week.

Plate 177. [*Photo.: L. F. Andersen.*

Thatched Farm Buildings on an English Estate.

A LAMB-MARKING AND BLOWFLY SPECIFIC.

A lamb-marking and blowfly specific should be an antiseptic as well as a healing agent; and, besides killing the maggots present, it should give some protection to the sheep or lambs against maggots developing from a future strike, and should be easily washed from the wool during the scouring process.

A mixture recommended for use is made up as follows:—40 per cent. Shell dieselene oil or Vacuum 28-38 fuel oil; 55 per cent. fish, herring, or cod oil; 5 per cent. cresylic acid; and 0·1 per cent. sodium arsenite, or 1 lb. to 100 gallons.

For convenience in making 5 gallons of the mixture, take 22 pints fish oil, 16 pints fuel oil (not more than 875 specific gravity), 2 pints cresylic acid, and 1 oz. sodium arsenite.

To Mix.—Place the fish oil in a 5-gallon drum and add the sodium arsenite; shake well, and then add the cresylic acid and fuel oil. Should the weather be cold, heat at least some of the fish oil, and add the sodium arsenite and shake to secure a good suspension, and then add the other ingredients as above. The mixture should be well shaken before using, and shaken up occasionally to keep the sodium arsenite in suspension while in use. Apply with a clean brush or swab. In purchasing in quantities to make 100 gallons of the specific, the approximate price per gallon, including the container, has worked out at 3s.

—*Jas. Carew.*

LAMB-MARKING.

Lamb-marking should be done under the most hygienic conditions possible. The work consists of castration and the insertion of the registered earmark on the off ear of ram lambs, and of marking similarly the near ear of ewe lambs. In addition, an age mark is frequently placed on the ear opposite the registered mark. Tails are removed from all lambs.

The ewes and lambs should be mustered and yarded the night before marking, thus avoiding operating when the lambs are in a heated condition, which leads to excessive bleeding.

All instruments should be cleaned and disinfected thoroughly. Earmarking pliers should be frequently dipped in a prepared disinfectant in the course of operations.

There are two recognised methods of castration—viz., slitting and tipping.

Slitting has its advantages in that it leaves the wether with a more pronounced cod. However, when flies are bad there is a greater tendency for the lamb to become flyblown. In tipping, the tip of the purse is entirely removed. Tipping is the better method of the two in the opinion of many sheepmen, as it leaves a cleaner wound with better drainage. The wound so made also heals more satisfactorily. Moreover, tipping is faster—a fact which counts when thousands of lambs have to be marked.

The best age at which to mark is from a fortnight to three weeks. A proved fly remedy, both curative and antiseptic, should be applied to all wounds. The use of old yards should be avoided if practicable.

—*J. L. Hodge.*

IMPROVEMENTS ON THE SMALL SHEEP PROPERTY.

When money is available a small grazing selection frequently carries improvements fit for a much larger property. On the other hand, when money is scarce, the small holding often lacks even the bare improvements essential to the well-being of the sheep and the handling of the clip.

A property has a certain capital value, and unnecessary improvements merely means over-capitalisation. Interest has either to be paid or allowed for this excess expenditure.

Certain improvements are, however, essential in all cases.

A substantial boundary fence and, should the district be dingo infested, netting and top netting are obviously necessary.

Next in importance is the water supply. Should there be adequate natural water the selector is fortunate. Failing natural water, wells, sub-artesian bores, surface tanks, or bore drains to conduct supplies from neighbouring bores must be provided. The type of watering facilities to be used is essentially a matter of economics. What pays best, particularly in drought emergencies, should be a guiding principle in the grazier's choice.

A horse paddock and yards for the handy working of house cows are among the first provisions to be made. This paddock should, of course, be handily situated to the homestead and should contain water.

Subdivisions of the property for the convenient working of sheep is seldom given sufficient thought. It involves not only the running of fence lines, but their construction in such a way that water is easily and continuously available to the stock. The fences should be substantially erected to obviate continuous drafting and boxing. Too much money may be spent in wrongly thought-out subdivisions, but, generally, the smaller the paddocks the better. The posts used for fencing should be of timbers proved in the district for their durability.

The shearing shed and drafting yards may, on a small holding, be close together. The shed should be well constructed and properly designed, but not larger than necessary for the competent handling of the numbers of sheep ordinarily run on the property. The yards also should be constructed substantially, and their correct design for the drafting of sheep is of first importance. Where shed and yards are together, the latter should be so placed that the shed can be conveniently filled with woolly sheep.

The situation of the homestead should permit the easy working of the property, and its cost should be no greater than the improved value of the holding warrants.

—*J. L. Hodge.*

How to Judge a Dairy Cow.

THERE is only one way to find out the productiveness of a dairy cow, and that is to test her, over her lactation period, by the Babcock method.

There are points, besides productiveness, to be considered in judging a dairy cow, however. Her capacity to produce must be supported by a sound constitution, a roominess of frame—a capacity for feed—by a good blood circulation system, and she must have dairy temperament and ability.

Constitution.

Constitution depends upon the amount of fresh air that is taken in through the nostrils, and upon the way in which the lungs use this air in purifying the blood. It follows that the cow with the big nostrils, and the ample windpipe, and the capacious lungs, is the sort of cow needed. Moreover, that part of the body which holds the heart and the lungs must be roomy. To ensure room for these organs a cow must be deep from the top of the shoulders to the floor of the chest, and she must be thick through this part, too.

The eye is another index to the constitution. One does not see alert, bright eyes on cows of poor constitution.

Capacity.

Capacity means capacity for feed. We must have large roomy cows with big mouths and strong jaws, large barrels, and well-sprung ribs. These cows are always keen for feed. They are the leaders of the herd when they go out to graze after leaving the milking yard.

A cow that is flat-ribbed never makes a milker; she has not the room to hold the feed, and she has not the digestive apparatus with which to handle large quantities of feed if she could take them in.

Is there any sign by which one can tell whether a cow has a good digestion or not? The skin is a great test of digestive ability. Take the skin of a cow between the fingers. Some cows' hides are so hard and tightly drawn that it is well-nigh impossible to pull it out an inch, let alone take a handful of it. Such hides are an indication of poor digestions. As a rule, they are covered with coarse, wiry hair that grows at right angles to the skin. On the other hand, some cows have hides so soft and pliable, so elastic, covered with such rich, soft hair, that there is no difficulty in deciding that they are making good and proper use of their feed.

Digestion room, as indicated by the large barrel, the well-sprung ribs, the quality of the skin, and the quality of the hair, is highly desirable.

We say that a beef cow turns her feed into beef, and the dairy cow her feed into milk. Digging deeply we find an interesting reason. When a cow has digested her feed in the fourth stomach the nutrients in the feed are absorbed by the blood. The blood carries and distributes the nutrients to those parts of the body where nature has need of it. It carries the nutrients to the back of the beef cow and to the udder of the dairy cow.

How can we tell what sort of circulation a cow has? Mainly by her "milk" veins and her milk wells. The so-called milk veins are not milk veins at all, of course. They are blood veins. These milk veins are usually two in number and convey the blood from the udder to the heart and lungs. The openings through which they enter the body are known as milk wells. If the flow of milk is large, the milk veins are developed and the milk wells, too. Many cows have extensions of the vein system under the belly—quite a network of large tortuous veins that have every appearance of being heavily worked. These are great cows. These are the producers. No matter how big a cow's mouth, no matter how deep her ribs, if she has not the proper development of her circulating system she will never be a producer.

Dairy Temperament.

Dairy temperament is not a trait that stands alone. It is dependent on some of the other factors that we have mentioned, more particularly on the circulation of the blood. A vigorous constitution, a large capacity, an ample supply of blood to the lower part of the body indicates a good producer. A cow will not be a good producer if she lacks the dairy temperament and a capacious udder of the proper texture and shape.

The dairy ability is indicated by the bright eye, the fine withers free of beef, the thin thighs, the large udder that is hung high at the back and runs well forward, by the alertness of the step, by the anxiety for more and more feed, and by the demonstrated capacity to turn that feed into milk instead of into beef.

A fleshy, pendulous udder is not indicative of good producer. Such an udder has only a scanty attachment to the body, and therefore little room in which to receive the arteries through which are being borne the materials for milk making. On the other hand, the udder that

extends well forward and high up at the back provides a large area for the entrance of the arteries and has ample room in which to attach itself to the body.

Width of udder development is determined by the build of the thighs. If they be thin they leave room for a broad udder. If they be beefy there is naturally no room for proper udder development. There should be a large arch between the thighs if the cow is to be a producer, and this arch should be filled with a vessel which, when milked out, collapses into a thin, soft-skinned, silky empty bag.

A good udder is an even udder. The four quarters are of equal size, or nearly so. It is a bad udder that makes twice as much milk in the hind teats as in the fore teats. The division of the quarter should not be noticeable, i.e., there should be no "bottle teats."

The shape of the udder is largely determined by the shape and conformation of the rump. The cow that has a great length between hip and pinbone and is level along this line usually has an udder that is well attached and that carries forward to a considerable extent. It is rarely that the forepart of the udder is any further forward than the hips, so that if the space between the pinbones is short, the udder must be short.

[*Photo.: L. F. Andersen.*

Plate 178.

One of the King's Herefords on the Windsor Castle Estate.

Cleanliness in the Milking Shed.

E. C. DUNN, Instructor in Dairying.

OBSERVATIONS at milking time on some dairy farms reveal carelessness which is dangerous from a viewpoint of infection from bacteria. Bacteria in milk and cream are well-known causes of low-grade, inferior products, and safeguards against their introduction are essential.

The milking bucket should on no account be used as a washing utensil, either for the udder and teats of the cow or the milker's hands. The act of washing the udder transfers innumerable bacteria with the dirt and loose hair to the bucket, and a simple rinsing in cold water is not sufficient to remove them all. The need for separate milking buckets and washing buckets is therefore very obvious.

A bucket and cloths for washing the udders and a wash basin for washing the hands before milking each cow are hygienic necessities in the bails. The dairyman may well ask himself the question: "Would I take my meals with hands unwashed after completing milking operations?" The answer would be an emphatic "No!" Yet the cleanliness of his hands during milking is at least as important, for milk and cream are foods which may be easily contaminated. Clean hands are just as essential during milking as at the dining table. It is therefore remarkable that many people who are scrupulously clean in the home are lamentably careless in the cowyard and dairy.

Another very common practice is the wiping of soiled, milky hands on the clothing. These same clothes, if worn throughout the day, soon acquire a most objectionable smell and attract flies. Sugar-bag aprons —which are easily made, inexpensive, and long-wearing—are suggested for use by all milkers. The aprons should, of course, be washed frequently.

The protection of milk against flies is also a matter for consideration. Most dairymen have in use a large, shallow milk vat, and this should be provided with a lid in which an opening has been left for the milk strainer, or, if milking machines are in use, for the releaser. This lid keeps out dust and vermin, and also is a help in maintaining the temperature of the milk before separating.

Hand milkers frequently moisten the cows' teats during milking from the milk in the bucket. This practice cannot be condemned too strongly, as the hands are usually soiled, and bacteria from the udder of the cow are transferred to the bucket.

The following points are all practised by the most successful dairymen:—

Wash the udders in buckets used only for that purpose.

Wash the hands after milking each cow.

Wipe the hands on a clean cloth, not on the clothes, and wear either an apron or overalls.

Aprons and overalls are easily boiled; so keep them clean.

Don't use on uncovered vat. Under the Dairy Regulations a cover for the vat *must* be provided.

WHAT IS A FAIR OVER-RUN?

The over-run paid out by butter factories is a much-discussed subject among dairy farmers. A question frequently asked is: "What is the maximum over-run obtainable by a factory where all weighings, tests, and other operations are carried out correctly?" Here is the answer:—

Over-run in Queensland is the excess butter actually manufactured over the amount of commercial butter (estimated from the approved chart) obtainable from all cream received at the factory. Butter of legal composition must contain at least 82 per cent. of fat, and to obtain the maximum over-run a factory must, therefore, convert every ounce of fat which it receives in the cream into butter containing exactly 82·0 per cent. of fat. Under commercial conditions this is impossible, as there is a proportion of the fat lost in various ways. There is a certain amount of cream spilt, or lost in other ways, during sampling, tipping, and processing; a further quantity of fat is lost in the buttermilk and, finally, there is a loss of butter in the packing process. The percentage of the total fat lost in these ways is approximately 0·2 per cent. in spillage, &c., 1 per cent. in the buttermilk, and 0·25 per cent. in packing—making a total fat loss of approximately 1·45 per cent. The effect of this loss is best illustrated by an example.

One thousand lb. of cream with a fat test of 40 would be paid for as 489 lb. of commercial butter. The actual quantity of fat in this weight of cream is 417 lb. A loss of 1·45 per cent. of this fat means that 6 lb. of fat is lost during handling and manufacture, leaving 411 lb. of fat which can be manufactured into butter. The maximum weight of butter of legal composition which can be manufactured from this quantity of fat is 500 lb., and the maximum over-run is therefore 11 lb. of butter on the estimated quantity of 489 lb.—equivalent to 2·25 per cent. It is not possible for a factory working under commercial conditions to consistently obtain this over-run, and it can be taken for granted that the over-run obtainable should be no higher than 2 per cent. A factory can only consistently exceed this figure by one or more of the following practices:—

(*a*) Cutting the weights of the cream.

(*b*) Cutting the fat tests.

(*c*) Manufacturing butter of illegal composition.

In the manufacture of unsalted butter, the over-run obtainable is considerably less than the figure given above. The maximum over-run obtainable on unsalted butter is 1 per cent., but under commercial conditions it is doubtful whether it could exceed 0·75 per cent. A factory which manufacturers both salted and unsalted butter should, therefore, have a lower over-run than one which makes salted butter exclusively.

—*L. A. Burgess and O. St. J. Kent.*

VALUE OF FARMYARD MANURE.

It has been estimated that although British farmers spend at least £4 millions annually in the purchase of chemical fertilizers, that amount is considerably less than the value of the plant food contained in farmyard manure made each year in the country. In spite of this, says a writer in the London "Times," farmers take much greater care of the plant food which they buy in a bag than of that produced in their own stock yards and paddocks.

FEEDING OF CALVES.

About 87 per cent. of cows' milk is water. Of the remainder, nearly one-third is fat, and a good separator, if properly operated, will remove about 98·5 per cent. of this fat. Very little protein is removed. It follows that, if the separated milk is to be made equal in feeding value to the original milk, either the fat or its equivalent must be replaced. There is no need to replace protein, and for this reason it is not good practice to feed such protein-rich materials as linseed meal in conjunction with skim milk to very young calves.

Dripping obtained from a reputable meatworks, or cod liver oil, may be incorporated in the milk, but they are rather expensive and difficult to mix properly. A better system is to use finely ground maize. Maize meal from good-quality grain contains as much as 5 per cent. high-grade oil and 70 per cent, of easily digested carbohydate which, to some extent, serves the same purpose as fat.

The new-born calf should get whole milk for a fortnight if it is to be given a good start in life. For the first few days it may be fed three times daily; after that, twice daily is enough. A safe level to feed is 1 gallon to each 100 lb. live weight. At the end of the second week a little maize meal is stirred into the milk and the change to separated milk begun. By the end of the third week the maize meal may be built up to a handful, and the change to separated milk completed. By the end of a month the calf begins to nibble grass, and can consume about ½ lb. of meal.

From then on to the eighth week the milk can be replaced progressively by water and a meal mixture. By the eighth week the calf will be able to eat up to 2 lb. daily of a suitable meal mixture.

Such a mixture may contain 35 lb. of linseed meal and 65 lb. of a cereal meal. Pollard and bran should not constitute more than one-half of the cereal meal. The remainder may be crushed oats, barley, or maize. About ½ lb. of salt and 2 lb. of sterilised bone meal should be included in the mixture.

As the animals take more grass or hay, the supply of the meal mixture is restricted. At six months, unless an adverse period is encountered, the calf should be able to fend for itself.

INFERIOR GRADE CREAM.

One of the most common sources of the contamination of cream, and one that if often overlooked, is the badly washed cream can. More cream is spoilt by being stored or carried in a badly washed can than by most other ways. This applies to cans in good order as well as those that are dinted and rusty.

The reason is not far to seek. Hundreds of cans pass through the same rinsing water of the mechanical can-washer at the butter factory daily, and although a final steaming is carried out in the last stage of the washing process, it is not of sufficient duration to sterilise thoroughly all of the cans thus treated.

It should be obvious that cans which have contained second-grade cream will require extra attention, in order to prevent the transmission of taints due to bacterial activity—such as cheesiness and rancidity—to the fresh supplies of cream.

A tallowy smell which is often found in returned cans may be due to inefficient washing, followed by exposure to the heat of the sun, causing deterioration of the fat.

It is, therefore, advisable in order to safeguard the quality of cream, to rinse all cans on their return from the butter factory with boiling hot water to which a little washing soda has been added. The cans should then be rinsed with clean boiling water to remove all traces of the soda.

The storage of the cleansed cans is important. They should be placed upside down on a suitable rack to allow for cooling and drying. On no account should anything but boiling water be used for the final rinsing, nor should any attempt be made to dry the cans with a cloth. The storage rack should be placed in such a position as to be well removed from any possibility of contamination from the stockyard.

—*C. L. Moran.*

DRY MILKING IS CLEAN MILKING.

Milking with hands which are moistened with milk at the beginning of and during milking is known as wet milking. Dry milking—which is used always by the cleanest and most efficient milkers—means commencing with clean, dry hands, which are kept as dry as possible during milking.

The method of milking with unwashed udders and teats and moistening the unwashed hands with milk is an objectionable and dirty habit and seriously contaminates the milk, as well as chapping the teats. To anyone who doubts this no further evidence is necessary than a glance at the accumulation between the fingers of a person who practises wet milking. In some countries where milkers' competitions are held at agricultural shows and elsewhere, deliberate wet milking disqualifies a competitor.

It should be remembered by the dairy farmer producing milk for city or town requirements that wet milking causes loss of keeping quality, a serious disadvantage in a warm climate.

It is often claimed that dry milking is difficult for anyone unaccustomed to it, and in attempting a more hygienic method, vaseline is used as a lubricant to make stripping easier and to help keep the teats soft and flexible. This is certainly to be preferred to careless wet milking, but if the teats are washed before starting to milk and the milker also washes and dries his hands frequently during milking—as required by the Dairy Regulations—both are generally sufficiently pliable and the use of vaseline should be unnecessary.

Injured or chapped teats should be protected during milking by placing round them a piece of cotton wool and afterwards applying a suitable ointment. The ointment hastens healing and softens the teats for the succeeding milking.

—*E. B. Rice.*

IMPORTANCE OF STIRRING CREAM.

Some dairy farmers show by the cream which they send to a factory that they lack knowledge in regard to the care of cream on the farm. Clean methods in production may be nullified by the spoiling of good cream in the dairy.

As butterfat is the lightest constituent of cream it rises gradually to the top as soon as the cream enters the can. Therefore, in unstirred cream the lower layers, rich in separated milk—which contains a high proportion of casein, and consequently a low proportion of butterfat—are at the bottom. Changes in the separated milk due to bacteria are often such that when the cream reaches the factory it is graded down as sour and curdy.

A dry film on the top of the cream or layers of different colours and texture through the can tells the grader at once that the cream has not been stirred, and he is immediately impressed by the defects in it.

To keep a uniform consistency of cream and to ensure the best possible ripening conditions the cream should be cool before it is added to any existing supply. Regular stirring is then necessary to liberate accumulated gases and aerate the mass, which ensure uniform consistency. Aeration not only reduces the temperature of the cream, but also retards the growth of undesirable bacteria.

Stirring pays because no dairy farmer can afford to lose the difference in price between choice and lower grade creams on each consignment that he sends to the factory.

—*G. B. Gallwey.*

MEAT AND BLOOD MEALS FOR DAIRY CATTLE.

Meat meals and blood meals sold under a variety of names are rich in digestible protein. A high-class meat meal with a crude protein content of 65 per cent. has about twice the digestible protein of commercial cottonseed or linseed meal. In farming terms, this means that 1 lb. of high-grade meat meal has about the same feeding value as 2 lb. of linseed or cottonseed meal.

The cost of meat or blood meal is not greatly different from that of the vegetable meals, and if they can be conveniently included in the ration of dairy cattle feeding costs will be reduced.

Only dairy cattle which have been consistently underfed take kindly to meat or blood meals. Cattle which have been accustomed to small quantities of these meals from birth also present no difficulty. As a general rule, however, dairy cattle only slowly acquire a liking for concentrates containing meat and blood meals and at first only a few ounces should be included in the regular ration. The amount can be gradually built up to the required level, which will, of course, depend upon the quality and quantity of other foods used. Advice on suitable rations may be obtained from the Department of Agriculture and Stock, but the dairy farmer can usually adjust the concentrates in the ration to conform with the milk yield of the individual cow.

Grain and molasses, grain and salt, milling by-products—such as bran and pollard or such attractive meals as linseed, cottonseed, or cocoanut—may be mixed with the meat and blood meals to attract unwilling cows.

Animals which still refuse to eat these meals may be kept for a short time without any food, other than that offered, if allowed plenty of water. It is important that the feed should be changed night and morning, so that a fresh mixture is always before the cow. If this system appears too drastic, the nose-bag method may be used. Freshly-chaffed green maize and the meal are mixed before using, and the contents of the bag should be changed night and morning. Most cattle can be induced to eat meat or blood meals by one or other of these methods.

Both meat and blood meals should be fresh, free from objectionable odour, finely milled, and sterile. An undue greasiness is not detrimental, but, in general, the higher the fat content the less palatable the meal.

Meat meals should show a good analysis. Any preparation with a crude protein content of less than 50 per cent. is not a true meat meal, but a meat and bone meal. Blood meal should show a minimum of 75 per cent. crude protein. It should be almost without smell.

As both meals decompose when allowed to remain in a moist condition they should be stored in a dry place and any excess in the feed boxes should be removed each day. Material which has been "fouled" by moisture soon becomes a source of danger and is then only fit for fertilizing.

[*Photo.: L. F. Andersen.*

Plate 179.

Dexter Cattle on a Farm in England.

Some Economic Factors in Pig Raising.

E. J. SHELTON, H.D.A., Senior Instructor in Pig Raising.

THE production of pigs is a business requiring specialised knowledge and application. It, however, is not one requiring a large capital or an expensive outfit, particularly where it is associated with dairying and mixed farming. Abundant supplies of suitable food and water, satisfactory accommodation, necessary utensils, a conveyance, and the correct type of stock are the principal requirements.

A larger amount of capital and more extensive plant will be needed by the specialist who intends devoting the whole of his time to raising pigs on a commercial scale, and by the breeder engaged in the production of stud pigs for breeding purposes.

There are relatively few, however, who become specialists, or who are really expert with this class of stock, although thousands of farmers are actively engaged in dairying pursuits who appear to be quite satisfied that pigs are a payable adjunct to the farm stock.

While some farmers are prepared to lay out from £2,000 to £3,000 on a 60 to 100 cow dairy farm, and do all within their means to bring the dairying side of the farm up to date, they "fall down on the job" when it comes to providing efficient accommodation and the correct class of breeding stock for the piggery, where between £200 or £300 is all that is necessary to establish an up-to-date pig section.

Quite a wide variety of crops are available to the pig farmer which are resistant to variable weather conditions in a very large degree. Among these are lucerne, sweet potatoes, Jerusalem artichokes, arrowroot, and mangel wurzels—all hardy and providing excellent food for growing animals and breeding stock; while saccharine sorghums, soft varieties of cow cane and sugar-cane, rape, maize, and similar fodder crops are useful in satisfying the hunger of brood sows and boars, and adding variety to the rations of younger stock, while many other crops also might be included among the available foodstuffs.

Pig Raising in Queensland.

Pig raising in Queensland is mostly conducted along the following lines:—

Dairy farm piggeries are carried on in conjunction with dairying, in which skim milk, whey, or in fewer cases buttermilk, form the major basic portion of the food used. This system combines the feeding of dairy products and farm-grown crops, and is invariably regarded as the safest and surest road to profit in the keeping of pigs; in fact, more than 90 per cent. of the pork produced in Queensland could be classed as "dairy-fed," a food product in universal demand the world over at payable prices.

Pig raising on mixed farms is another method largely in vogue, and becoming still more popular. It involves the cultivation of corn, barley, and wheat, green crops, root crops, &c., and for that reason is more dependent on seasons of liberal rainfall.

In what may be classified as commercial piggeries, pigs are regarded as a special line, being fed on buttermilk, grain, greenstuffs, &c. This system operates in conjunction with butter factories, and, in fewer instances, in conjunction with cheese factories, where supplies of whey are available, and under expert management it is a profitable undertaking. It, however, requires a much wider knowledge of the business and closer detailed attention with, possibly, a good deal more trading capital.

Slaughter-house piggeries may also be classed as commercial piggeries in the sense that they are dependent upon the by-products of a butchering business—soup, meat, and burnt or charred bones. This latter type of piggery is the least satisfying, because most slaughter-houses are situated in areas unsuited to the cultivation of crops and the amount of offal available is often strictly limited.

Suburban pig farms are holdings on which pigs are fed on the waste food from hotels, cafes, manufacturing establishments, markets, &c. Under expert control such undertakings are likely to be profitable.

Stud piggeries are usually associated with dairy farming and commercial pig farm ventures, or on a small scale under the general heading of suburban pig farms, or as a specialised business at Agricultural colleges and Government farms. The stud pig business is one requiring a special knowledge and routine, and needs to be conducted on strictly business lines to be a success.

Junior pig farmers comprise another section in which is included those enthusiastic and progressive members of Pig Clubs whose operations, while conducted on a strictly limited scale, are of great importance to the industry. As the Pig Club and Junior Farmer movement expands, many more members will be enrolled, who will eventually enter the ranks of senior pig farmers, equipped with better knowledge and understanding than would otherwise be possible.

Breeding for Profit.

In the selection of breeding stock only purebred boars from productive, prepotent strains should be chosen. The brood sows should carry all the breeding possible and be of a prolific, matronly type, well able to suckle and rear thrifty, profitable litters. The sows should be pure bred or first cross only, because mongrel pigs pay no profits and they lower the standard and generally discourage those associated with the business. It is fortunate that, in the pig industry, reliable breeding stock of the very best quality are readily procurable at rates within the reach of every farmer.

Preparing the Piggery for Winter.

T. ABELL, Field Assistant, Pig Branch.

BEFORE winter comes, some preparations should be made to ensure comfortable quarters for the pigs on the farm. Although in Queensland the stock may not use the shelters for a long period, when they do have need of cover it should be ready for them.

First of all, the drainage from the piggery should be inspected. After the wet season the drains are often silted up, and pools may have been turned into deep, foul wallows. The drains should be cleared, and the wallows drained and filled in. This will prevent water from lying in the yards after winter rains. Wet, sloppy yards in the winter time make the pigs uncomfortable, and consequently more or less unthrifty. In addition, the discomfort to the men who have to carry on routine feeding, &c., in the piggery is of some importance.

Where the sheds and feeding troughs are movable, they should be shifted to a fresh site. If the sheds and troughs are fixed, any holes or wallows against them should be filled. Then the sheds themselves should be inspected for cracks in the lower walls and floor, and any such cracks should be closed. Guard rails should be examined in the farrowing sheds, and all troughs cleaned and examined for necessary repairs.

At the end of summer there is usually a quantity of rank grass growing. If cut and stacked, this will be useful as bedding for winter litters.

Fences in a piggery generally need some attention during the year, and while the other work is being carried out it is advisable to inspect the fences for loose wires and posts, and to fill in holes made by pigs trying to root under the fence lines.

Where foods are boiled for pigs, it is a good plan to examine the fireplace and boiler and ensure that it will not be necessary to make repairs during the winter months when the boiler will be in daily use.

Although much of this labour may appear unnecessary, the farmer who understands animal management will realise that, apart from the fact that equipment is receiving an overhaul, the work is being done with one main object—to ensure the comfort of the stock. Where pigs are kept under comfortable conditions they generally prove more economical growers than those which are neglected, for the contented pig is a quicker grower and usually requires less feed per 1 lb. gain in live weight. Thus, for his own benefit, the pig-raiser should make sound preparations for the winter months.

SALT FOR WORKING HORSES.

A good farm horse is well worth his feed. Most farmers realise this, but all too frequently plough horses may be seen licking the dried sweat from each other.

Working horses are incapable of sustained effort without a liberal supply of salt, and when the food is low in this mineral they try to remedy the deficiency by licking the saline deposit from evaporated sweat round the collar, saddle, and other gear of a team mate.

It is, therefore, sound practice to keep rock salt in a convenient place for working horses.

THE FARROWING SOW.

During pregnancy the sow should be given as much freedom as possible, for activity promotes health and good digestion, to the advantage of the sow and its prospective litter.

Her food should not be stinted, but she should be kept in moderate condition. Sows which are too fat at farrowing will probably have trouble in delivery, and may also suffer from many other troubles, of which milk fever is only one. On the other hand, if the sow is kept too short of food she cannot nourish the young pigs properly while carrying them, nor can she suckle them properly when born.

At the time of farrowing a close watch should be kept by the usual attendant—strangers upset the sow—who should not interfere unless there is evidence of trouble in parturition or the sow attempts to bite her young. This sometimes happens when some of the pigs remain to be born and one of those already dropped tries to get to the teats; especially if it squeals, the sow—usually a young one—will seize the piglet in her mouth and quickly squeeze the life out of it. Should she break the skin and taste blood, she may turn on the rest of the litter and eat them. The attendant can prevent this by taking each piglet as it is dropped and putting it aside in a straw-lined box until all are born, when they may be put on to the teats and all will be well.

For the first two weeks after farrowing the sow does not require more food than she received during the last two weeks of pregnancy, but after this the supply should be gradually increased as she requires it.

Pig feeding is dealt with in detail in a pamphlet obtainable on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Draughts, dampness, and uncleanliness, as well as unsuitable food for the mother, will cause scouring, which may lead to death.

Given reasonable care and attention, no trouble should arise, and this little extra care means the difference between a strong, healthy litter and a few stunted, unthrifty runts.

—*W. Dixon.*

POINTS OF A GOOD BOAR.

When selecting a boar the best available should be bought, for during his life he may be the sire of hundreds of pigs, while the sow can only produce a limited number. If the boar is good he will improve the standard of the herd. His selection, therefore, is of very great importance.

The boar should come from a large, thrifty litter, and be obtained from a reliable breeder. He should be a little more on the compact side than the sow, not too chunky or short, but showing full development at every point, and of a strictly masculine type representing the full type of his breed. He must show quality, smoothness, and evenness in every part, have a typical masculine head, with eyes and ears wide apart, the jowl reasonably full and well laid on to the shoulders, which should be smooth and free from wrinkles. He should have a full heart-girth extending well down to the bottom lines, nearly or quite on a level, with as deep a flank as possible. He should possess rather short or medium length legs, with bone of fair size and quality, pasterns short and straight, and the hoofs well set, legs standing square, straight, and well under him. A long, wide and deep ham, and tail well set up are also desirable characteristics.

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Disease in Poultry Acts*, 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal, and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the name of the owner, of the hatcheries registered up to and including 30th April, 1938:—

Name and Address.	Name of Hatchery.	Breeds kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, White Wyandottes, Rhode Island Reds
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns

Name and Address	Name of Hatchery.	Breeds kept.
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
T. Westerman, Handford road, Zillmere	Zillmere ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington Stud Poultry Farm	Australorps, White Leghorns, and Black Leghorns
A. Malvine, junr., The Gap, Ashgrove	Alva	White Leghorns and Australorps
F. S. Morrison, Kenmore, *via* Indooroopilly	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns

Following is a list of persons who have applied for registration:—

Name and Address.	Name of Hatchery.	Breeds kept.
J. Cameron, Oxley Central ..	Camerons ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
Mrs. G. Crawford, Stratford, *via* Cairns	Rho-Isled ..	Rhode Island Reds
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, Langshans, and White Leghorns
Elks and Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
Gustafson, C. E. and C., Box 24, Tannymorel	Bellevue ..	White Leghorns and Australorps
F. J. Lambert, Acacia Vale, Townsville	Lamberts ..	Australorps and White Leghorns
H. L. Marshall	Stonehenge ..	White Leghorns and Australorps
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
F. J. Mottram, Ibis avenue, Deagon	Kenwood ..	White Leghorns
J. McCulloch, White's road, Manly	Hindes' Stud Poultry Farm	White Leghorns, Brown Leg horns and Australorps
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction ..	Fairview ..	White Leghorns and Langshans
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkins ..	White Leghorns and Australorps
R. H. Young, Box 18, P.O., Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns, and Australorps

FINED AND PILLORIED.

Because of its being the first of its kind in London, widespread publicity was given to a police court decision in England in February last. A food retailer, summoned for having exposed for sale and intended for food thirty unsound eggs which were obviously unwholesome, was fined £15 and ten guineas costs, or three months in prison. The court also directed that a notice be placed on defendant's door warning the public to keep away from his shop.

Nutritional Requirements of Poultry.

POULTRY-RAISERS as a whole have a very fair idea of the principles and practice of feeding, and take into consideration factors that make for efficient and economic production.

The present-day values of cereals may induce some to depart from old and accepted practices in order to reduce costs. There are three points, however, that must not be lost sight of if the best results are to be obtained and the general health of the stock maintained—viz., the vitamin content of the ration, the protein content, and the quantity supplied.

Vitamins.—Vitamin A is of outstanding importance at the present juncture, for a shortage in the ration may cause outbreaks of nutritional roup as well as lowered egg production. The feeding of yellow maize and green feed ensures a sufficient supply of this vitamin. The price of maize will, however, preclude its inclusion in the ration to the same extent as in past years. Wheat will be used to replace this cereal, and so one source of vitamin A is lost.

On most poultry farms during the winter months green feed is not plentiful; consequently, under normal circumstances the loss due to a shortage of maize cannot be overcome. It is, therefore, of paramount importance that the poultry-raiser should make a special effort to supply the birds with good, succulent green feed. Green feed is the cheapest form in which the birds' requirement of this vitamin can be supplied. In cases where home-grown feed cannot be obtained, poultry-raisers should use at least 10 per cent. of good green lucerne chaff or meal in the mash fed to their birds.

Protein.—To obtain the maximum economic production, laying birds should have in their ration (i.e., grain and mash) a total of approximately 15 per cent. of crude protein. Maize has about 10 per cent. and wheat about 13 per cent. of protein. Where maize has been used extensively and is replaced with wheat, it may be desirable to reduce slightly the protein content of the ration. This is most easily brought about by a slight reduction in the meat meal fed.

Generally speaking, however, the protein-rich meat meal is not overfed, and its greater use is advisable in certain circumstances. This is particularly so in the case of the poultry-raiser who feeds extensive quantities of skim milk to his birds. With the approach of winter the milk supply will probably diminish. In such cases the loss of protein of animal origin in the form of milk should be supplemented with meat meal.

Quantity.—Providing the right kind of food is being used, economic production is only possible by feeding the birds all they will consume. Do not be afraid of making your birds unduly fat. The good producer will convert the food supplied in excess of body requirements into eggs. Birds which cannot do this should be culled and sold for table purposes.

Points for Poultry Breeders.

J. J. McLACHLAN, Poultry Inspector.

THE poultry farmer, in selecting birds for breeding purposes, should reject any bird which does not measure up satisfactorily in constitutional vigour, irrespective of other considerations.

A strong bird has adequate size, is well-fleshed, with prominent eye, full face, a sprightly carriage, and is very alert and active.

Although there actually is no egg-laying type of bird, there are some very definite laying characteristics which are valuable in the selection of birds for either breeding or production. For instance, capacity is essential to permit of the necessary expansion in the reproductive organs of a hen. The ovary develops from about the size of a two-shilling piece to approximately the full circumference of a teacup, and the oviduct from about 9 inches long and $\frac{1}{2}$ inch wide to about 18 inches long and $1\frac{1}{4}$ inches in width. In addition to this it may be mentioned that a laying fowl consumes more food than a non-layer; thus the intestines would contain more food. A bird should have a long, deep, wide body, or, in other words, capacity.

The head is another valuable guide, particularly in respect to health. The face should be full, red in colour, and fairly free from feathers. Sallow or sunken-faced birds should be avoided. The eye should be full, round, bright, prominent, and expressive.

Strict attention should be paid to the colour of the eyes, particularly with breeds that should have red eyes, as there is a tendency for such breeds to have greenish-coloured eyes. Birds with green or light-coloured eyes are prone to become short-sighted and even go blind early in life. The skull should be strong but fine, and birds with overhanging eyebrows should be avoided.

The plumage of the bird, as it walks around the pen, should be examined, and careful notice taken as to whether the plumage fits close to the body or is loose and fluffy. As the tight or close-feathered bird usually is a better layer than the loose-feathered bird, it is only natural that only the former should be bred from. To the inexperienced person the contrast in feathering is more easily noticed in heavy breeds such as Australorps than in White Leghorns.

The thickness of the shanks is a good guide with respect to the coarseness or fineness of the bone. A coarse-shanked bird is a coarse-boned bird, and generally a poor layer. A layer-breeder has fine shanks, and the undersized bird, as a general rule, has over-refined or spindly shanks.

Any bird which is a known layer of small eggs should be passed over. As far as is possible only birds which lay eggs slightly above 2 oz. in weight should find their way into a breeding-pen.

Special care must be given to the selection of the male bird. All the features mentioned regarding type of females apply also to males. An active, alert bird should be selected, as such males will give better fertility and stronger chickens than will dull, slow birds. Young males can be mated with more females than older birds. Twenty females can be mated with a White Leghorn cockerel and sixteen females with an Australorp cockerel, if in each instance a vigorous male is used.

Male birds, the sons of known producers of large eggs, are most valuable as the characteristic of production is transmitted from the hen, through her son, to her granddaughters.

Should pullets be used as breeders? is a question that is frequently asked. The answer to that is that if they are fully matured and up to standard in respect to type and size, and produce eggs of the recognised weight of 2 oz., they should be equal to older birds as breeders. Why object to breeding from pullets and at the same time use cockerels for mating purposes? It must be admitted, however, that where records are kept of egg production, breeding from hens which are heavy layers has proved more profitable than breeding from pullets, which more or less are an unknown quantity.

BREEDING FOR EGG PRODUCTION.

In breeding poultry the farmer should exercise the utmost care in order to establish and maintain a high quality flock. The progress made in the past has been considerable. Egg production has been increased from about 60 eggs to over 200 eggs per bird per annum, many individual pullets laying over 300 eggs in a year.

In dealing with the egg production in a flock of birds consisting of an equal number of pullets and hens, many authorities quote 12 dozen as a fair average annual production. It is doubtful, however, whether there are many poultry farmers in Queensland who obtain an average production per bird of less than 13 dozen eggs yearly. In some experiments conducted at the Animal Health Station, using White Leghorns purchased from a poultry farmer as day-old chickens, the average production over the two years was 181 eggs per bird, the variations being—pullet year, from 194 to 209 eggs; second year, from 155 to 162 eggs. There were 116 pullets used in this experiment, and it will be noticed that the average of the two years was over 15 dozen eggs, and even these birds in their second year laid over 13 dozen. These birds were kept under poultry farm conditions.

The poultry farmer should be able to obtain an average production at least equal to those figures. A constant high average production is only obtainable by good breeding in conjunction with good management and feeding.

The chief considerations in arriving at the standards of good breeding are:—Type, constitutional vigour, action, and laying characteristics. Having selected birds that are reasonably true to type, care must be taken to see that they are of strong constitutional vigour. This is indicated by the vitality, stamina, health, brightness, and alertness of the bird, and is of equal importance to the knowledge of the actual number of eggs laid. As an example, some years ago the first three birds in a laying test laid 302, 296, and 294 eggs respectively. An examination of these birds at the conclusion of the test showed that the first and second birds were weak in constitution, whereas the third bird was very strong. All these birds were used as breeders, but while the progeny of the first and second hens were disappointing layers, the descendants of the third bird have performed very well in laying tests every year since. That example should emphasize very clearly the necessity for rejecting birds that are weak constitutionally.

Admittedly it takes courage not to breed from a 300-egg bird. If such a bird produced the eggs without a heavy drain on her body she would be constitutionally strong. If, however, the bird rapidly loses

condition during the year, she is obviously weak in constitution and consequently would probably be an indifferent breeder. Any bird that is unable to stand up to a heavy season's laying without losing condition cannot be expected to give high-laying progeny and should be discarded irrespective of other characteristics.

TYPE IN THE BREEDING BIRDS.

Type is an important consideration in breeding birds, and they should be reasonably typical of the breed. Although any type of a bird will lay eggs, White Leghorns should resemble White Leghorns rather than white fowls lacking any uniformity. This applies to all breeds as well as White Leghorns.

In selecting birds for trueness-to-type it is necessary to become conversant with the standard of the breed, and a good illustration depicting the outline of the bird will prove most helpful. Breeding birds should be fairly uniform in type, showing length, depth, and width of body in accordance with the breed standard. Birds having these features always make better breeders than those without them. In the flock there will be some birds which are very long with very deep and wide bodies. Such birds ("beefers" as they are termed) are too large and coarse. Big coarse birds are poor layers and are of little value as breeders. Coarse birds can easily be detected when handled because of their excessive body weight—about 2 lb. above the standard weight. Coarse birds utilise foodstuffs more for the storing of body fat than for production of eggs, and should therefore be disposed of for table purposes.

In contrast to the big bird, there is the small or undersized bird which is frequently an excellent layer, but is valueless as a breeder because it is seldom that small birds produce progeny that will be profitable layers. To learn to differentiate between a coarse, good, or small bird, an inexperienced person may pick out one of each as they appear in the pen and handle each one several times, noting the length, depth, and width of body as well as the weight. Much will be learnt from such a systematic method of handling. It will be found that whilst there will only be a few coarse birds, as a general rule there will be a large number of small birds in every flock unless special care has been taken previously in the selection of breeding birds. This tendency to deterioration in the size of body is very common and can only be overcome by paying special attention to the size of the birds used in the breeding pen.

VENT PICKING.

Every year numerous pullets are lost as a result of vent picking, an acquired vice, which is easily checked when correct control measures are adopted in the early stages. If neglected or overlooked until it is firmly established, control is much more difficult. This vice is confined chiefly to pullets and starts shortly after they commence laying. At times outbreaks will occur among older hens, but in these it is usually less extensive.

Vent picking starts as the result of one bird picking the vent of another bird when it is expelling an egg. The picking causes bleeding and frequently protrusion of the oviduct follows. Once the birds acquire the taste of blood, they are ever on the alert for victims. The pecked

bird may be able to get away from the attacker, but in all probability egg laying will keep the wound open and it often becomes septic, resulting in a whitish watery discharge from the vent. Eggs laid by the injured bird will frequently be smeared with blood.

Treating seriously injured birds is of little value, because they seldom make a complete recovery. If considered advisable, however, the injured parts of birds that have been pecked may be painted with Stockholm tar twice daily.

All nest boxes should be darkened by hanging bag curtains in the front of the openings. These curtains encourage the birds to lay in the nests, and, to some extent, reduce the liability to pecking.

As pecking is usually the outcome of idleness, a handful of small grain should be scattered twice daily in the litter on the floor to keep the birds busy scratching for food. If the quantity of litter is insufficient, open a bale of straw in the centre of the shed and allow the birds to scatter it over the floor. The litter supplied should cover the floor to a depth of about 4 inches. At the present time litter is costly, but it would be cheap in comparison with the value of the birds that may be lost from vent picking without its aid. Where litter is not available, some relief may be obtained by feeding a very small meal of wet mash twice each morning for several days. The feeding times could be at approximately 8 a.m. and 11 a.m., the quantity fed at each meal need not exceed 4 lb. dry weight per 100 birds.

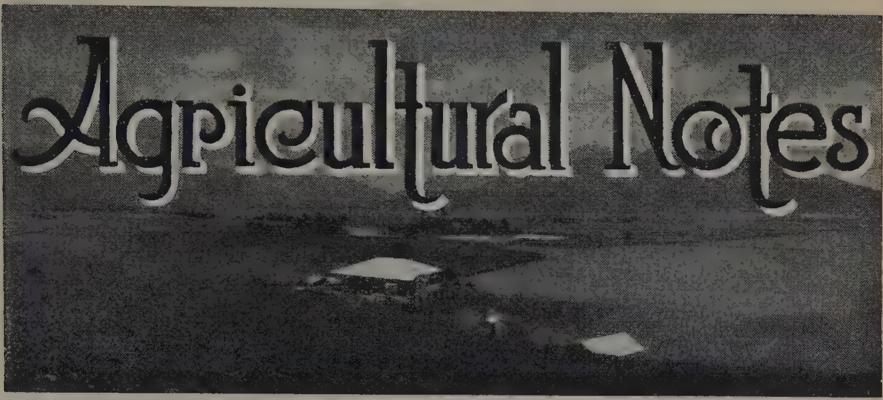
BRITISH POULTRY INDUSTRY PROBLEMS.

The serious mortality occurring in the poultry flocks of Great Britain was responsible for the appointment of a technical committee to investigate problems confronting breeders, and in the report that has been furnished to the Ministry for Agriculture recently, drastic proposals, including the establishment of a poultry stock improvement commission, were made. The commission would be charged with the following duties and applications:—

(*a*) The compulsory registration of every distributor of stock, hatching eggs, and day-old chickens, subject to such exemptions by reason of small number or otherwise as the commission may decide.

(*b*) Suspension or withdrawal of registration from distributing centres, which, after inspection, were deemed unsuited to carry out such distribution by reason of disease or of the obvious unfitness of stock for breeding purposes, or of grossly unhygienic conditions.

(*c*) The application of such conditions of registration of hatcheries as were calculated to ensure that the hatching eggs were obtained from pullorum-free stock of reasonably good quality.



Fungicidal Treatment of Cereal Seed.

NOW that the normal sowing season for wheat and other winter cereals is approaching, it is necessary to point out the advisability of treating seed for the prevention of smut, unless the seed available was harvested from a crop known to be perfectly free from the disease.

Ball smut or bunt of wheat can be prevented effectively by the use of a seed dressing, but grain which is highly contaminated should not be used as seed.

Reasonably clean seed should be treated with one of the bunticidal dusts marketed in Queensland, all of which are effective. They include three brands of copper carbonate, a copper oxychloride named Smutal, and the mercury dusts Agrosan and Ceresan.

The mercury preparations are somewhat more expensive than the others, but have the advantage of being less unpleasant to use. They float less in the atmosphere, and do not tend to clog or grind the cogs of the seed drill. Drill breakages likely to occur owing to excessive accumulation of dust in the seed cups can be prevented by throwing the drill out of gear before commencing the day's work and turning the drive shaft with the crank handle supplied for cleaning purposes.

All treated grain should be regarded as poisonous, and not feed to domestic animals. When handling mercury dusts care should be taken not to allow the dust to accumulate between the fingers, as it will blister tender skin on prolonged contact. The wearing of a dust mask is also advised for use during all dry seed treatments.

From 1 oz. to 2 oz. of the bunticidal dust should be mixed thoroughly with each bushel of seed. This may be done by rotating the seed and dust together in a dust-tight cask, box, or drum, mounted so that it may be easily revolved, but is most expeditiously carried out in a special machine in which the dust is incorporated with the grain as it runs through a series of baffles.

Modern seed graders are fitted with attachments for applying dust to the seed and save the trouble of any additional operation. Growers not equipped with the necessary plant may arrange with contractors for the grading and dressing of wheat seed.

Loose smut of wheat cannot be controlled by chemical treatment of the grain, as infection with the disease is carried over from season to season within the seed. A hot-water treatment has been devised to free it from infection, but it is somewhat cumbersome and cannot be recommended for general use. Details are given for those who may wish to try it, but, owing to the risk of spoiling the germination of the seed, growers are warned against using it on a large scale until thoroughly conversant with the method. The seed to be treated should first be soaked in cold water for five hours. Prepare a boiler of hot water, and have a supply of cold water ready and a vessel to hold the seed for treating. Fill the last mentioned with water at a temperature of 129 deg. Fahr. by mixing the hot and cold water. Place the soaked seed in this, and stir it for ten minutes, maintaining the temperature by suitable additions of hot or, if necessary, cold water. Finally, cool the seed by plunging it in cold water; drain and plant it as soon as possible.

The smuts of oats and barley cannot be controlled completely by copper carbonate; some mercury seed dressings, including Agrosan and Ceresan, are, however, effective in dealing with these diseases, and all farmers growing oats for seed purposes or barley are advised to treat their seed with this material unless they are certain that it came from a clean crop. When planting only a few bags of seed, some growers prefer a wet treatment, and with oats and barley the use of formalin—not bluestone—is permissible. The method of application is as follows:—Turn the seed out on to a tight floor and sprinkle it with formalin solution made up by adding one part of commercial formalin to 40 gallons of water. Continue turning and sprinkling until all the seed is just moist. Cover the heap with bags moistened in the solution and leave it overnight. The seed should be planted the following day. As the seed swells to some extent, the drill should be set to a higher planting rate than when using untreated seed or seed treated with a mercury dust.

Plate 180. [*Photo.*: *L. F. Anderson.*

The Head of a Jersey Herd on an English Farm.

The Trench Silo.

W. H. BECHTEL, Instructor in Agriculture.

LARGE quantities of suitable fodders—comprising maize, sorghums, panicum, lucerne, and useful native grass and herbage mixtures on cleared pasture areas—are growing at present throughout most of the coastal districts. That interest is being taken by some farmers in the conservation of the season's abundance is shown by the number of pit silos constructed recently for the reception of the summer fodder surplus. There also is, however, some evidence of apparent apathy in respect of the establishment of fodder reserves. As much of this material has now reached the prime stage, the best way to conserve it would be to place it in a trench silo, and the attention of dairy farmers is directed towards this cheap and effective method of storage.

A few important points in the construction, method of filling, and emptying of the trench is briefly given for the benefit of interested farmers.

Select a reasonably level and well-drained site as near the place of feeding as conveniently possible. Mark it out according to the capacity required. A trench 30 feet in length, 8 feet wide at bottom, 12 feet at top, and 8 feet deep, having an outslope at each end of 1 in 3 grade, would hold approximately 45 tons. By altering the length and retaining the other measurements, the capacity may be increased a ton for each additional foot length.

To construct the trench, excavate according to the desired dimensions, using plough and scoop and depositing the spoil along either side to back up the logs, which should be placed lengthwise to raise the walls 2 feet above the surface. Complete the job by trimming the walls smooth with mattock and spade.

The cost of construction involves labour only, and the time taken would vary according to the nature of the ground. In ordinary circumstances, two men equipped with suitable plant should excavate a trench of 45-tons capacity in about two or three days.

In filling the trench silo there is no necessity to chaff the material, full-length crops being loaded in the field and drawn through the trench, off tipped, and spread in even layers lengthwise, the empty vehicle passing out the other end. Thus each layer is consolidated as a result of the trampling of the horses action throughout the whole filling process.

Should the crop be at all dry through over-maturity or as a result of frost, a sprinkling of water may be added during the filling process. The filling should continue well above the surface, forming a parapet of about 3 feet high, sloped towards the sides of the trench.

Complete the filling by covering it with grass well watered, finally topping with a 9-inch to a 12-inch layer of earth.

The material so stored will be fit to use as silage in from two to three months after filling, if so desired, or it may be safely stored for many years without undue deterioration or loss.

To remove the silage for use, the trench should be opened up at one end, taking the earth and grass covering from a portion only as required, and cutting down vertically with a sharp implement, such as a spade or hay knife. When a complete face section from top to bottom has been removed, an adze may be used to slice off additional material in a semi-chaffed or short-chopped form, resulting in its being in a more acceptable condition for feeding direct to stock without further preparation.

The silage may be fed as it is to practically all classes of stock. For cows in full milk, however, better results are obtained by the addition of a small quantity of protein-rich fodder and concentrate—such as lucerne chaff and cotton-seed meal.

DODDER IN LUCERNE SEED.

Lucerne is grown from seed and is usually sown with the object of providing a stand for several years. With this in mind, only the best seed should be bought with an assurance that it is free from dodder.

Dodder is an annual parasitical plant found in the warmer parts of the world. Its seed germinates in the soil, sends up a stem and attaches itself to the host plant which, in Queensland, is mostly lucerne. It is leafless, with twining thread-like stems, which attach themselves to the host plant by means of tubercles; from then onwards the parasite draws its nourishment from this source and severs its connection with the soil. The immediate effect is that the host plant is called on to support not only itself but also the dodder until ultimately the exhausted plant dies, in most cases smothered in a tangled mass of light brown threads. Dodder produces seed quickly, so that it can run the full life cycle (seed to seed) before the host plant dies from starvation. Dodder seeds are borne in a globular capsule with four seeds in each. These seeds are pressed together, giving them their characteristic flattened surfaces.

Unfortunately, this parasitical growth is common in lucerne fields. Experience shows that the dodder seeds cannot be removed satisfactorily from lucerne seed with cleaning machinery, or by sieving; this statement is based on many unsuccessful attempts to make saleable dodder-infested lucerne seed.

Growers of lucerne seed, in fairness to themselves as well as to those who may buy their seed, *should never harvest seed from a dodder-infested field.*

It should be borne in mind that any seed for sowing, or any material found to be dodder-infested, is subject to immediate seizure, and the person offering infested seed for sale is liable to prosecution. A £50 fine is provided for the sale of lucerne seed containing dodder. No excuse can be accepted for the presence in seed or feed of such a destructive parasite which can well be considered as lucerne's worst enemy.

Buyers should always insist on an assurance that the seed they are purchasing is dodder-free.

Samples of lucerne seed representing seeds purchased by farmers for their own sowing are examined free of charge, at the Seed Testing Station, Department of Agriculture and Stock, Brisbane. Samples should be of not less weight than 4 oz., and marked as follows:—

Sample of   seed drawn from   bags
representing a total of   bags marked   .
Purchased from   of   on   .

Name and address of sender, and date.

It is better to send a sample for examination as soon as it is purchased, rather than wait until the crop has grown, and then find it contains injurious weeds.

—*F. B. Coleman.*

ONION-GROWING.

As onion sowings are usually made during April and May, the incidence of the rainfall received during the winter months is of the utmost importance, and, when deficient, has to be supplemented by irrigation. Owing to its deep-rooting habit, the onion can withstand limited dry spells, but the best results are obtained where the growing period is fairly moist, with drier conditions towards maturity and during harvest.

Rich, well-drained, sandy loams, friable and easy to work, have proved the most suitable, producing onions of good appearance and better keeping qualities than where grown on heavier soil types. Sandy soils tend to produce bulbs of good size but low keeping quality, while heavy soils will induce thickened or bull-necked plants.

The preparation of land intended for onion cultivation will now be nearing completion, and it must be remembered that deep cultivation should be avoided as the sowing period approaches.

The seed may be broadcast in seed-beds from which the plants are transplanted to their permanent positions in the field. Alternatively, the seed may be sown in the permanent drills. The latter method is usually adopted in Queensland utilising the "Planet Junior" type of hand seeder, and placing the seed in drills 12 inches to 15 inches apart, which will be found to call for 2 lb. to 3 lb. per acre. The seed should only be lightly covered with not more than ½ inch of soil, as deeper sowings germinate very poorly.

When the young plants are 4 inches to 5 inches high they are thinned out to a distance of 4 inches to 6 inches in between plants, a practice usually carried out with the aid of a 2-inch chipping hoe.

In the southern districts sowings may be continued during May, while in the central and northern districts the period can be extended to July. If sown too early, losses may result from flowering, while if too late, the bulbs may be small owing to insufficient time in which to mature before the hot weather causes scalding. Sow late-maturing varieties early and early-maturing varieties late. Only freshly-grown, tested seed should be utilised, as onion seed deteriorates rapidly, and it is therefore preferable to buy seed from reliable sources.

The Brown Spanish type, including "Early Hunter River Brown Spanish," is the most popular, the onions being of good appearance and flavour and possessing good keeping qualities.

The hand cultivators of the "Planet Junior" type are useful for inter-row cultivation, as all weed growth must be kept in check. The soil should not be thrown up against the bulbs, the object being to draw the soil away rather than towards the plants, thus inducing the formation of bulbs. If the soil is not drawn away, bending over the tops with a twisting motion will assist in the formation of bulbs. When the seed-bed has been thoroughly prepared it will be found that very little hand weeding is necessary. Further information may be obtained on application to the Department of Agriculture and Stock, Brisbane.

The Problems of Arsenic Applications to Soil.*

R. W. MUNGOMERY.

IN certain areas in Queensland there are some canegrowers who strongly advocate the application of white arsenic to the soil as a method of control for cane grubs. Now it is obvious that any method of soil treatment must be closely examined from two viewpoints, firstly, the immediate effect on the pest and, secondly, the permanent effect on the soil. As for the first point, it is a fact that the advocates of arsenic treatment have not been troubled with what can be regarded as heavy infestations of cane grubs while, in addition, their particular fields have usually been of a soil type which—due to its clayey nature—allows a small number of grubs to feed on the cane roots without the stool showing noticeable injury. That is to say, in their case, the degree of grub infestation usually fluctuates somewhere around the point where grub damage may or may not result.

Systematic diggings have shown that applications of white arsenic at the rate of 100-200 lb. per acre will kill some 60-70 per cent. of the grubs. Consequently if arsenic be applied under conditions of light to medium infestation it will reduce the grub population to numbers from which little or no damage will be sustained. Where, however, the grub population is such that the killing of some two-thirds will still leave sufficient grubs to cause appreciable damage it follows that arsenic treatment is ineffective as a method of control.

Added to such limitations is the question of costs. The arsenic must be applied to the field before it is known whether grub attack is probable or even possible. This arsenic must be applied to the whole of a field, whereas in practice it is often found that dangerous grub infestation is found to be restricted to a small portion of a field. The object of this note, however, is not to discuss costs but to draw attention to the second point mentioned above, namely, the effect of this treatment on the soil.

Some two and a-half years ago we had occasion to institute experiments with white arsenic applications to red schist soil at the Meringa Sugar Experiment Station, where small plots were treated with varying quantities of arsenic ranging from nil to 1000 lb. per acre. The arsenic was applied to the surface of the soil and lightly hoed in. About a month later (December, 1935) sorghum was sown and an excellent germination was secured in all plots. The growth of sorghum in the different plots was very uneven, ranging from, say, very poor in the 1000 lb. plots to very good in the non-treated plots. Eight months later (August, 1936) the plots were planted with Badila cane, and again the growth of the crop was very variable; a definite stunting occurred in the 250 lb. plots, while only about half a crop was obtained from the 1000 lb. plots. After harvesting these plots the stools were dug out, and this experimental area was then included in the adjacent field, and the whole was planted to Badila in August, 1937. At the present time (January,

* From *The Cane Growers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock) for April.

1938) the plots where arsenic was applied in 1935 still stand out clearly, the cane being much smaller and stooling less vigorously than in the non-treated plots.

It is true that few, if any, farmers make applications of arsenic equal to the minimum of 250 lb. listed above, but nevertheless the continuous usage of even the lightest dressings as used by farmers will soon give an accumulated soil content greatly in excess of 250 lb. per

Plate 181.

Section of arsenic-treated plots at Meringa Station. The slow growth and small stooling of cane in the foreground (planted in August, 1937) shows the continued ill-effects of arsenic applied in 1935.

acre. Under such conditions harmful effects must be expected, since arsenic is not dissolved out by rain and irrigation water but accumulates in the soil.

There is little doubt that crop damage as a result of arsenic accumulation is now commencing to become evident on certain farms in the Giru area. The cane is showing a yellow, unthrifty appearance long before grubs are present in the soil, and there is no doubt that sub-normal crops will result, at least for some years, whether grubs are present or not.

EASY SCRUB FEEDING.

Thoughtless men cut down useful fodder trees; others merely lop off the top branches. Both ways are wasteful, and regrowth is a matter of months, or even years. The most economical method is to flail the leaves off. By stripping the foliage in this way, the twigs remain to make new growth within a few weeks, when the process can be repeated.

Lime on the Farm.

F. B. COLEMAN and R. A. TAYLOR, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

RECENT amending legislation relating to the sale of lime for agricultural purposes provides that every bag of lime shall have a label attached to it setting out the following information:—

The kind of lime.
The percentage of lime and forms in which it occurs.
The neutralising value.
The net weight.
The fineness (unless prepared by burning).
The name and address of manufacturer or dealer.

The chief original source of lime for agricultural purposes in Queensland is limestone rock, from which the following principal kinds of lime are derived:—

Burnt lime.—This is made by burning lumps of limestone, and providing it is packed and railed when freshly burnt, is a "concentrated" source of lime.

An average quality burnt lime should analyse—

90 per cent. lime (CaO) as calcium oxide, and neutralising value, 160.

When burnt lime is exposed to the air, the lumps crumble to a fine powder—which is *air-slaked* lime. An average quality air-slaked lime should analyse—

50 per cent. lime (CaO) as calcium carbonate.

10 per cent. lime (CaO) as calcium hydroxide, and neutralising value, 107.

Old samples of air-slaked lime contain all the lime (CaO) in the form of carbonate.

Rain and moisture added to burnt lime indiscriminately will merely assist in the formation of air-slaked lime, but when moisture in equivalent amount is added to burnt lime—under controlled conditions—a true slacked lime, or hydrated lime is formed.

This is usually too expensive for application to the soil, but is of higher quality than air-slaked lime. An average analysis would show—

70 per cent. lime (CaO) as calcium hydroxide, and neutralising value, 125.

This type of lime in time will also gradually alter until the lime (CaO) is all in the form of carbonate.

It is important to remember that burnt lime when purchased should be in *lumps*, and slaked lime in powder form.

Burnt lime is used in certain chemical processes; the resultant by-product is known as *processed* lime, and contains the calcium oxide (CaO), chiefly in the form of carbonate.

An average quality processed lime should analyse—

46 per cent. lime (CaO) as calcium carbonate, neutralising value, 86; fine, 50 per cent.; coarse, 50 per cent.

Pulverised limestone is the original rock quarried and ground.

An average quality material should analyse—

50 per cent. lime (CaO) as calcium carbonate, neutralising value, 90; fine, 80 per cent.; coarse, 20 per cent.

Other important limes for agricultural purposes are—

Earthy lime, which is an impure form of lime carbonate that can easily be worked by digging, being softer than limestone, and usually requiring screening only. An average quality material should analyse—

45 per cent. lime (CaO) as calcium carbonate, neutralising value, 80; fine, 65 per cent.; coarse, 35 per cent.

Magnesian limes for agricultural purposes are pulverised limestones or earthy limes containing appreciable quantities of magnesia.

The maximum percentage of magnesia (MgO) as magnesium carbonate must be declared on the label, and this should be considered by the farmer with a view to the application of the material for particular purposes.

Limes which have been burnt may be compared on a neutralising value basis only.

Other forms of lime may be compared within their own respective groups on a neutralising value and fineness basis.

Neutralising value is a figure expressing the capacity to neutralise the soil, and ranges from about 80 in an earthy lime to about 160 in a burnt lime.

Fine material is that which will pass through an aperature of one one-hundredth of an inch square.

Buyers of lime of a greater value than 10s. should receive an invoice bearing the warranty required by the Act in respect of its quality.

On no account should purchasers accept delivery of lime for agricultural purposes that is not labelled and invoiced in the manner outlined in this note.

All complaints as to the quality, &c., of any lime purchased for agricultural purposes should be forwarded to the Fertilizer Investigation Branch, Department of Agriculture and Stock, William street, Brisbane.

THE USE OF CONCRETE IN FARM BUILDINGS.

The general use of concrete in all manner of modern structures suggests that this material might be used to even greater advantage on the farm than is the case at present.

In addition to its high degree of permanence and low maintenance cost, it offers other distinct advantages not shared by timber or iron buildings. For tropical conditions a cavity-wall concrete building provides a degree of personal comfort in hot weather which no single-walled structure as instanced can give. The accompanying photographs

Plate 182.

Illustrating the construction of barracks with pre-cast cavity blocks.

(Plates 182 and 183) illustrate the use of pre-cast cavity concrete blocks in the construction of farm barracks and cookhouse. These were erected on a farm in the Burdekin area, where a readily available supply of sand and gravel were at hand. The farmer claims that these buildings cost little more to erect than the standard barracks.

Plate 183.

Another view of the barracks and cookhouse constructed of concrete.

Full constructional details will be supplied to any canegrower interested in the subject.

—*H. W. K., in "The Cane Growers' Quarterly Bulletin."*

LUCERNE ON THE DOWNS AND MARANOA.

Although comparatively few settlers in the Western Darling Downs and Maranoa districts have established lucerne stands, it is significant that most of those who have done so plan a considerable increase in acreage. The qualities of lucerne as a grazing proposition, both for sheep and cattle, are gaining wider appreciation outside the recognised agricultural regions. The results obtained on scrub and forest lands during the dry spells of 1936 at Gulguba, Columboola, Wallumbilla, and other localities are very encouraging. An adaptation of lucerne to a wide range of soils and a capacity for giving good results under adverse climatic conditions were clearly demonstrated.

In sowing lucerne high seeding rates are unnecessary and have been the cause of many failures in the past; 3 to 4 lb. per acre is quite heavy enough for the districts named.

With the wide variation in farming conditions and soil types that obtain in these districts, hard and fast rules regarding sowing are not practicable. The following points are, however, important:—Deeper sowing than ¾ inch is inadvisable in all soils, except those of a self-mulching nature where, if necessary, the depth may be a little greater—provided that there is sufficient moisture to give the plant a good start in addition to germinating the seed.

Where old wheat land is to be converted into pasture it is usual to sow the lucerne with the last crop of wheat. This method reduces costs to some extent, but in soil that has a tendency to pack or cake after rain it is advisable to drill the wheat in first and then follow with the lucerne—having the drill hoes out of the ground and covering with light harrows. This avoids planting the lucerne at the same depth as the wheat—i.e., 2-2½ inches.

When broadcasting it is difficult to get an even sowing with the small seed; but if two sowings are made, one across the paddock and the other in the opposite direction, a more even crop can be obtained. Only light harrows should be used to cover the seed.

On small holdings where more intensive culture is practised a method of sowing which might commend itself to dairymen, particularly in the Maranoa district, is to plant lucerne in rows 18 inches to 2 feet apart. Inter-row cultivation may then be practised, when necessary, after rain. Established in this way, the plant has exceptional drought resistance, and an area of green feed for emergency use is assured.

All settlers in the reclaimed prickly-pear country might well turn their attention to lucerne as a grazing crop. With light seedings it is not expensive to establish, and is well worth a trial.

—*C. H. Defries.*

A GREAT COW.

One of the most remarkable dairy cows tested under the standard herd test belongs to a Victorian Jersey herd—the Finchley Herd, at Maffra. The cow is Finchley Handsome Lady, and she completed a test recently with 8,180 lb. of milk, 7.11 average test, and 582 lb. of butter-fat. This cow has had five official tests and each has averaged over 7 per cent.

A Seasonal Reminder to Central Queensland Tomato-growers.

W. J. ROSS, Senior Instructor in Fruit Culture.

THE commencement of the tomato season in Central Queensland has been seriously delayed this year because of unfavourable weather conditions. The absence of adequate spring and summer rains has caused growers to defer the sowing of seed and the raising of plant supplies. However, the bounteous March rains have stimulated preparations for an early planting-out of seedlings. Many growers will, in all probability, look to nurseries for supplies, but the majority will raise their own plants.

If seedlings are sought from outside sources, they should be obtained from reliable growers offering varieties true to type and free from crop-reducing pests and diseases. Correct attention to the seed-bed is of paramount importance in the production of strong, healthy plants. Hygienic practices in the seed-bed will greatly assist in reducing losses from diseases and pests.

When preparing the seed-bed, select a small area of newly-burnt virgin scrub land on which no lantana had previously grown. Level or slightly sloping ground is preferable. Oblong beds only wide enough to permit the grower to reach to the centre without undue exertion are advisable. They should be dug to the depth of an ordinary garden fork, and raised about 4 inches above the natural surface of the ground to ensure drainage. The soil in the beds should be reduced to a fine tilth and the surface levelled and firmed with the back of a spade before sowing the seed. When seed has been evenly and not too thickly scattered over the beds, cover lightly with fine soil. Treatment of seed with a solution of corrosive sublimate before sowing is a desirable practice. Information on seed treatment methods may be had on application to the Department of Agriculture and Stock.

To assist even germination of seed, the bed may be lightly covered with dry grass or hessian. Should hot sunshine prevail after the young seedlings appear, remove the covering from immediately above them to a higher level on a framework made with light forked sticks and cross-pieces.

Harden the developing plants, so that they can withstand conditions in the field, by gradually reducing the grass or hession covering until they are fully exposed to the sun for a short period before transplanting. Frequent watering of the seed-bed to maintain an even and ample soil moisture condition is essential. During the time the young plants are growing in the seed-bed they should be sprayed and dusted as a safeguard against pests and diseases. A 2—3—40 formula of Bordeaux spray mixture is recommended as a control of tomato plant diseases in seedlings. The chief seedling pest is the tomato mite, for which dusting with a good grade of dusting sulphur is recommended. The sulphur may be conveniently applied with a dust gun or by shaking it over the seedlings from a sugarbag or some similar container which allows the dust to filter through the mesh.

When plants have grown to a height of 6 or 7 inches, they are ready for transferring to their permanent location in the field. In removing plants from the seed-bed, care should be exercised to ensure the minimum amount of damage to root hairs during the operation. A thorough wetting of seed-beds before removing plants will greatly assist in reducing undue disturbance of the root system.

A convenient tray for the transport of seedlings from the seed-bed to the field can be made with a shallow box and by affixing two small uprights and nailing a cross-piece between them at the top to serve as a handle. Such a tray will protect plants against damage during transplanting operations.

Sowing seed directly into permanent positions within the field has advantages where irrigation can be practised or where good soil moisture conditions obtain, but it is not a recommended practice for the Central district, because of the unreliability and erratic nature of the rainfall.

CABBAGE-GROWING FOR MARKET.

C. N. MORGAN, Fruit Branch.

The cabbage is one of the most important vegetables for the market gardener. It grows best in the cooler districts, but by carefully selecting varieties the crop may be grown in most parts of Queensland.

The seed should be sown in beds of well-drained, deeply and thoroughly worked soil. The soil, if heavy, should be improved by the addition of sand or decayed vegetable matter; if poor and sandy, the addition of a loamy soil or well-rotted manure will be beneficial.

The surface of the bed should be fertilized and firmed, and the seed sown thinly in shallow drills about 4 inches apart. After sowing, mulch the bed with well-rotted leaf mould to prevent excessive evaporation of moisture.

The seed-bed must be watered regularly, for a check in the growth of young seedlings is often followed by unsatisfactory results.

When large enough to handle, the seedlings should be thinned to an inch apart, for if grown too thickly they develop into long, spindly, weak plants.

Shading during the hottest part of the day is often necessary, but this shade should be removed as soon as the plants are strong enough to withstand the heat. Overshading also produces spindly plants. Approximately 1 lb. of seed will provide sufficient plants for an acre of cabbage.

In about six weeks the young plants should be large enough for transplanting. They should be hardened off by restricting water supplies for some days before their removal to the field. Transplanting should be done in cloudy or showery weather, but if weather conditions are unfavourable the young seedlings should be watered in, and, as a further precaution, the top half of the leaves may be trimmed off to lessen transpiration until the root system is established.

Loosening of the soil in the seed-bed with a fork before lifting the plants helps to save many of the small roots. If the bed has been well soaked previously, the plants will lift with a ball of soil adhering to the roots, which will help to keep them moist.

The roots of the young plants should be kept damp after removal from the bed, and this may be done by standing them in a bucket containing a puddle of soil and water.

In planting, a hole is first made in the ground with a dibble—an old spade or digging fork handle is suitable. The hole should be only deep enough to allow the roots of the seedling to reach the bottom of the hole. Turn in a little earth, and then draw the plant slightly upwards before pressing the soil firmly around it. This ensures that the main root will not be doubled up.

The plants should be in rows 3 feet apart; in the rows the smaller varieties should be spaced 2½ feet and the larger varieties 3 feet apart. The growth of cabbages should on no account be checked. Regular cultivation and watering are, therefore, essential.

Correct varieties should be selected for different times of the year. Winter-planting types should be early and quick maturing.

In the cooler areas, seed of the early varieties is sown during autumn. Main crop varieties are sown between August and December. The coastal districts are best suited to the winter crop.

Cabbage should be marketed as soon as possible after cutting; and only good, firm-hearted vegetables should be sent for sale. Care in handling is essential, and when placed in bags for railing they should be packed as firmly as possible.

Recommended varieties are:—

Early.—Early Allhead and Early Drumhead, both of which are large, early, and quick growers.

Main crop.—Succession is the most popular variety, and may be grown almost any time. It is a good large Drumhead type.

Surehead is slightly larger than Succession. It is hardy, and may be planted closer in the rows, as it has fewer outside leaves.

RIPENING OF BANANAS.

To ripen bananas on a large commercial scale a properly constructed room, or rooms, with insulated walls are necessary. Probably the most convenient size for such a room would be 12 feet long by 8 feet wide by 7 feet 6 inches high, such measurements allowing for 100 cases capacity. Factors that must be taken into consideration, when building ripening rooms are insulation, air circulation, ventilation, cooling, heating, and humidity control. Details are set out in the C.S. and I.R. Bulletin, No. 64, which is available to anyone interested.

To ripen bananas for home consumption, or a small local trade, is an entirely different proposition. Directions covering such work are as under:—

Allow the fruit to become fully matured prior to cutting. After harvesting, cut the hands off and allow them to drain for one hour. Obtain a 50-lb. tea chest or similar box. Stand it upon two pieces of 3 feet by 2 inches timber to permit a current of air to pass between it and the floor. Pack the hands of bananas carefully round the inside of the chest, being sure to leave the centre open. Next, place a small handful of carbide in the centre of the chest and cover over in a manner that makes the inside of the chest or box as near to airtight as possible. Two or three thicknesses of canvas, or four thicknesses of corn sacks, are usually satisfactory.

Take the covering off after sixteen hours and recharge by placing another small handful of carbide on the floor of the chest. Recover it and allow it to stand for a further twelve to sixteen hours, after which uncover it and the fruit then will be almost ready for sale. If not quite ready, recover it but without carbide.

In very warm weather, only one application of carbide may be necessary. Ventilating the chest after sixteen hours is very necessary. Keep the chest under shade.

—*H. J. Freeman.*

THE SUGAR BANANA.

The sugar banana has been grown profitably for all the "bunch" trade markets in Queensland. Small, sweet, and delicately flavoured, this fruit claims many staunch supporters.

For the production of this banana deep, warm alluvial flats, favoured with a generous rainfall or watered by irrigation, are most suitable. As with other varieties, good drainage is essential. As the sugar banana possesses a slender stem, damage by wind must be guarded against, and where there is no permanent windbreak it is worth while establishing one at the time of planting. For this purpose double border rows of lady fingers or sugar banana plants may be planted 7 feet apart in the row and 7 feet between the rows. The spacings in the inner row should actually lie between the spacings in the outside row—i.e., planted according to the septuple system. These two rows close quickly in towards each other and rapidly form an effective windbreak. Of course, the planting of a permanent windbreak of suitable trees would be far more valuable on account of their permanency, provided the cultivated area is reconditioned from time to time.

Prior to planting, the soil should be worked to a depth of at least 12 inches and reduced to as fine a tilth as possible. The holes for the young plants in the plantation area should be 14 feet apart, 15 inches deep, and 18 inches square. The rows should be lined out as straight as possible each way, thus allowing the greatest convenience in working horse-drawn cultivating implements.

Opinions differ somewhat in the matter of selection of planting material, but generally a vigorous young sucker about 4 feet high dug from a matured stool is most favoured. The top portion of the sucker should be removed, leaving a plant of 3 feet in height to place in the hole. The plant is placed in position within the hole and sufficient surface soil placed in around it to fill approximately two-thirds of the actual cavity. The rest of the cavity is filled in gradually as the ground is cultivated during the ensuing year. According to the quality of the soil, one or two followers are allowed to come away, and, normally, the first bunches will be harvested seventeen or eighteen months after planting.

Farmyard manure applied judiciously to sugar banana plantations will repay the grower handsomely. Light horse-drawn implements are satisfactory for cultivating, and green crops, such as Poona and field peas, are excellent soil invigorators, provided they can be turned back into the soil at the correct time—i.e., when still very soft and succulent.

As the sugar banana is usually marketed in the bunch and the fruit possesses a thin, delicate skin, special care in handling is necessary in order to obtain the best market returns.

—*E. P. Williams.*

HANDLING OF CITRUS FRUITS.

The harvesting of citrus fruits is now in progress, and for several weeks to come growers will be chiefly concerned in the marketing of their crops.

Care in the handling of citrus fruits pays the grower handsomely. Rough handling contributes towards wastage losses in export fruit and in fruit being held by local markets, because, chiefly, of green and blue moulds, which are familiar to every citrus-grower.

These moulds are fungal parasites disseminated by means of spores which chiefly gain entrance to the fruit through bruises and skin abrasions.

The healthy unbroken skin of the orange is proof against almost all decays.

Abrasions may be caused during picking operations by the finger nails of careless pickers, or by allowing the clippers to cut into or prick the rind of the fruit when cutting the stem.

By the use of clippers with cup-shaped blades and rounded points, there is no excuse for the fruit being clipper-cut, whilst the gloves on the hands will prevent finger-nail injury.

All stems should be cut off short and smooth, otherwise they are likely to puncture the skin of other oranges during handling.

Another source of damage is protruding nails on the inside of the picking boxes, the points pricking into perfectly good oranges, causing punctures through which spores may enter.

The picking boxes should be well made; the internal surfaces of the boxes should be finished smooth to avoid friction during transit of the fruit from the orchard and the packing shed.

It is not only necessary for the orchardist himself to be careful, but he must also see that his employees are not negligent.

In the packing shed most growers make some provision to ensure cleanliness; nevertheless, there are some who do not appreciate the obvious necessity for hygiene. Occasionally uncovered buckets and tins are observed containing mouldy fruits in various stages of breakdown which are allowed to accumulate from day to day. Where this occurs those responsible for the cleanliness of the shed fail, apparently, to realise the enormous number of spores produced from mouldy fruit which are dispersed in the form of "mould dust" capable of reproducing the same decay in all punctured and bruised fruit with which it comes in contact. It is essential that all waste and reject fruit which accumulates during each day's work should be effectually destroyed daily. Moreover, a frequent washing of the floors of the packing shed with a ½ per cent. caustic soda solution, or other suitable fungicide, will reduce mould contamination within the shed.

—*R. L. Prest.*

THE ORPHAN TREE.

Many failures are observed where replacements are made in a bearing deciduous fruit orchard. Frequently, the young tree remains like an unwanted orphan and shows only stunted growth. If it is to catch up to the other trees and fill in an unsightly and unprofitable blank space in the orchard, careful attention must be given to all details in its management.

The main causes of failure are:—

1. The lack of natural plant food for the young tree.

2. If the old replaced tree died from the attacks of some particular diseases, the replant may be attacked in turn and suffer an initial setback.

3. Searching roots of adjacent trees may compete successfully with those of the young tree for the available plant food.

4. Lack of attention.

When digging out the unhealthy tree, carefully remove and burn all the roots together with the tree. Leave the hole open and exposed throughout the winter, and just prior to planting in spring fill with a load of virgin soil to which may be added some well-rotted animal manure. Virgin soil is obviously richer in plant nutrients than soil which has been cropped exhaustively for some considerable time.

The young tree is very often forgotten and does not get the necessary attention at the right time. Weed growth may tend to choke it, but this difficulty can be simply overcome by the use of an old fertilizer bag. The bag is opened out and, after making a cut in the middle, is slipped over the young tree. This makes an excellent mulch which keeps down weed growth in the vicinity of the tree and conserves the moisture so necessary for its progress.

—*A. M. Richardson.*

In Memoriam.

ERNEST GRAHAM.

Plate 184.

Mr. A. Ernest J. C. K. Graham, Under Secretary of Agriculture and Stock, and Director of Marketing, passed away in St. Martin's Hospital, Brisbane, on Sunday, 1st May. He was in his office as recently as the previous Tuesday when he was obliged to give up the heroic struggle which he had waged for two years against failing health.

Mr. Graham's name will go down in the annals of this State as one of the framers of much of its present-day marketing schemes and the development of agriculture generally. He was

closely associated with the framing of the Dairy Produce Act of 1920, which has been used as a basis for similar legislation overseas, and for many years he had had charge of the administration of other important measures bearing on dairying.

The late Mr. Graham was born at Wagga, New South Wales, and would have been sixty-two years old next month. He was educated at the Bega public school and Grammar School, on leaving which he entered the service of the New South Wales Creamery Butter Company. He also studied agricultural chemistry. Before coming to Queensland in 1906 he had held important managerial positions in the dairy industry of New South Wales, where he was the first to introduce the practice of grading cream and to apply the principle of payment according to quality. He was for some time instructor in dairying at Gatton College. Then he took over the managership of the Queensland Farmers' Co-operative Dairying Company at Booval. He, however, soon afterwards was appointed a dairying expert in the Department of Agriculture, and rising step by step, became on 1st January, 1925, the occupant of the principal permanent position in the department, following Mr. E. G. Scriven. Meanwhile, he had filled the offices of Chief Dairy Expert and Director of Dairying and Cold Storage.

When the Council of Agriculture (the executive of the Queensland Producers' Association) was formed, Mr. Graham was appointed Government representative on that body. He was a member of the standing committee of agriculture of the Commonwealth Council for Scientific and Industrial Research, and one of the Queensland representatives on that council. He also was member of the standing committee of agriculture of the Australian Agricultural Council, of the State Nutrition Council, and of the Faculty of Agriculture within the University of Queensland, besides being chairman of several important committees associated with departmental services and administration.

In addition to other offices, Mr. Graham was a member of the Australian Dairy Council and chairman of the State Dairy Board.

His knowledge of the primary industries was as varied as it was sound, for he was an accepted authority on the growth of fodder crops, animal husbandry, and modern dairy factory practice. For many years he lectured on these subjects, in which he combined academic knowledge with a sound practical training; his administrative powers were quite as outstanding. Both as author and collaborator he was responsible for the publication of numerous bulletins and pamphlets on various aspects of agriculture and animal husbandry, of which among the more notable were "The History of Dairying in Queensland," "Dairying in Queensland" (an economic survey), and

several on the economics of cotton-growing, sugar production, and poultry and pig raising. Besides being associated with the initial organisation of farmers under the Primary Producers' Organisation and Marketing Acts, he remained in close touch with the legislative machinery which the several commodity pool boards constituted under the Acts have, from time to time, found necessary in connection with their marketing operations. His annual reports on the operations of these pools were remarkable for their lucidity and able presentation of the facts of the contemporary agricultural situation, particularly in relation to the special and extremely intricate economic problems with which agriculture is confronted the world over.

The late Mr. Graham was a keen student, an omnivorous reader, and something of an authority on English and classical literature, and was gifted with unusual powers of observation and a remarkably retentive memory. He was a prodigious worker, a great home lover, with an extraordinary capacity for friendship. He won his way to success through sheer merit and fine character—a success that left him quite unspoilt. He remained the same unassuming, courteous gentleman to the end.

He was laid to rest in the Bulimba Cemetery in the presence of a very large gathering of his friends and former associates, among whom were the Minister for Agriculture and Stock, Hon. Frank W. Bulcock (representing the Government and State Parliament), representatives of other departments and every branch of the Department of Agriculture and Stock, of the Council for Scientific and Industrial Research, the Council of Agriculture and associated farmers' organisations, the Royal National Agricultural Association, the University of Queensland, Ex-Students' Association of the Queensland Agricultural High School and College, and the professional and commercial life of the city. To his bereaved relatives, deep sympathy is extended.

The Minister's Tribute.

A tribute to the work of the late Mr. Ernest Graham as Under Secretary of Agriculture and Stock was paid by the Minister.

"Agriculture in Queensland has lost one of its most faithful servants," Mr. Bulcock said. "Mr. Graham was intimately associated with the development of the department for a number of years, and during the six years I have been Minister for Agriculture he has been a tower of strength, more particularly on the economic side of agriculture in the development of which he played a very material part. The department will be the poorer for his death, but the value of the work he did for agriculture will never be forgotten.

"The sympathy of all in my department is extended to Mrs. Graham and family on their loss of a very fine gentleman."

Plate 185.
On the Road to Glen Niven, near Stanthorpe.

NATIONAL RADIO TALKS.

The following programme of national talks, supplied by courtesy of the Australian Broadcasting Commission, will be given over the national network of broadcasting stations, including 2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN, 5AN, 5CK, 7ZL, 7NT.

National talks for Mondays and Wednesdays, 7.40 to 7.55 p.m., are arranged for three or four months in advance. For other days and at other times, they are arranged from month to month.

All times stated are *Eastern Standard Time.*

SUNDAYS.

9.10 to 9.30 a.m.

Countryman's Session each Sunday.

(Queensland Listeners tune in to 4QG, 4RK, or 4QN.)

9.15 to 9.30 a.m.

Special National Talk on the First Sunday in every Month.

(For this Session South-Eastern Queensland must tune in to 4QG instead of 4QR.)

JUNE.

5th—
"*How the Scientist Can Help the Farmer.*" By Professor A. E. V. Richardson (Melbourne).

3.0 to 3.20 p.m. every Sunday.

"*With Our Cricketers in England.*" By Mr. F. S. Burnell (Sydney).

(A chat about the cities or the counties in which the Australian Team will be playing each week.)

6.30 to 6.45 p.m.

MAY.

15th—
"*Science in the News.*" By Professor W. J. Dakin (Sydney).

22nd—
"MEMORIES OF THREE CITES (Series). "*Rome.*" (First Talk.) By Professor Walter Murdoch (Sydney).

29th—
"*Science in the News.*" By Professor W. J. Dakin (Sydney).

JUNE.

5th—
"*Paris.*" (Second Talk in the series "Memories of Three Cities." By Professor Walter Murdoch.

12th—
"*Science in the News.*" By Professor W. J. Dakin (Sydney).

19th—
"*London.*" (Third Talk in the series "Memories of Three Cities.") By Professor Walter Murdoch.

26th—
"*Science in the News.*" By Professor W. J. Dakin (Sydney).

JULY.

3rd—

"AN AUSTRALIAN CREED" (Series). *"Drifting or Steering."* (First Talk in this Series.) By Professor Walter Murdoch.

10th—

"Science in the News." By Professor W. J. Dakin (Sydney).

17th—

"The Enemies of Progress." (Second Talk in the series "An Australian Creed.") By Professor Walter Murdoch.

24th—

"Science in the News." By Professor W. J. Dakin (Sydney).

31st—

"Wanted—A Common Platform." (Third Talk in the series "An Australian Creed.") By Professor Walter Murdoch.

AUGUST.

7th—

"Science in the News." By Professor W. J. Dakin (Sydney).

8.30 to 8.50 p.m. every Sunday.

"INTERNATIONAL AFFAIRS."

MAY.

15th—

Dr. E. R. Walker.

22nd—

Dr. G. L. Wood.

MONDAYS.

7.40 to 7.55 p.m.

MAY.

16th—

"THE VIEWPOINT CHANGES" (Series). *"War."* By Mr. J. A. McCallum (Sydney).

23rd—

"Morals." By Professor G. V. Portus (Adelaide).

30th—

"Home Life." By Mrs. Clarence Weber (Melbourne).

JUNE.

6th—

"YOUTH AS CRITIC." (A Series designed to give the young men an opportunity to criticise). *"Our Universities."* By Mr. L. F. Crisp (Adelaide).

13th—

"Is Democracy a Sham?" A Discussion between Messrs. K. Ditterick and Montague Brown (Melbourne).

20th—

"The Distribution of Wealth." A discussion between Messrs. E. Ward and Horace Brown (Melbourne).

27th—

"Our Pleasures." By Mr. N. T. Lovell (Sydney).

JULY.

4th—

"Religion." By Mr. F. W. Coaldrake (Brisbane). (To be broadcast from Sydney.)

11th—
"AMERICA TO-DAY" (Series). By Mr. C. Hartley Grattan. *"A Chat on America's Economy."*

18th—
"A Chat on America's Cultural Life."

25th—
"NEW ZEALAND'S NEW DEAL" (Series). By Mr. N. M. Richmond (Brisbane). *"New Zealand's New Deal"*—Part I.

AUGUST.

1st—
"New Zealand's New Deal"—Part II.

8th—
"An American's Views on New Zealand's New Deal." By Mr. C. Hartley Grattan.

TUESDAYS.

A National Talk will be arranged somewhere between 9.30 and 10.0 p.m. each Tuesday.

WEDNESDAYS.

7.40 to 7.55 p.m.

MAY.

18th—
"GREAT AUSTRALIANS" (Series). "And still they Live." *"Sir Charles Kingsford Smith."* By Mr. Norman Ellison (Sydney).

25th—
"MY VISIT TO GERMANY" (Series). By Professor S. H. Roberts (Sydney). *"Adventures in Nazidom."*

JUNE.

1st—
"Interviews with Nazi Personalities."

8th—
"IN THOSE EARLY DAYS" (Series). By Professor Ernest Scott (Melbourne). *"What Napoleon Bonaparte may have said to Bougainville."*

15th—
"Two Races that were never Run."

22nd—
"Amalie Dietrich."

29th—
"Why not an Australian Culture?" By Mr. P. R. Stephenson (Sydney).

JULY.

6th—
"Why not an Australian Culture?—Another View." By Mr. J. I. M. Stewart (Adelaide).

13th—
"SOME 'OUT OF THE WAY' BOOKS." *"The Saga Spirit."* By Mr. Ian Maxwell (Sydney).

20th—
"Folly in Old France."

27th—
"THIS, CHANGED THE WORLD" (Series). *"Discoveries by Stone Age Man."* By Mr. F. S. Shaw (of Hobart). (Broadcast from Melbourne.)

AUGUST.

3rd—

"Gunpowder." By Professor E. J. Hartung (Melbourne).

10th—

"Coal." By Professor E. J. Hartung (Melbourne).

17th—

"Vaccination." By Professor W. A. Osborne (Melbourne).

24th—

"Bacteria." By Professor W. A. Osborne (Melbourne).

31st—

"The Engineer through the Ages." By Sir Henry Barraclough (Sydney).

SEPTEMBER.

7th—

"Steam." By Sir Henry Barraclough (Sydney).

14th—

"Electricity." By Sir Henry Barraclough (Sydney).

THURSDAYS.

7.40 to 7.55 p.m.

The National Talk on each Thursday evening during May will be a Review of "CURRENT BOOKS WORTH READING."

As from 5th June, the National Book Review will be broadcast on Sundays at 10.15 a.m.

FRIDAYS.

7.40 to 7.55 p.m.

A National Talk will be arranged every Friday evening at this hour.

MAY.

13th—

"Are you Superstitious?" By Mr. Hermon Gill (Melbourne).

WEDNESDAYS AND FRIDAYS.

2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN.

6.0 p.m.

"A FORUM FOR TEACHERS AND STUDENTS."

National Talks on Wednesdays and Fridays are arranged specially to interest young people. Usually these Talks will be broadcast by young people themselves. During May the subject of the Talks and Discussions will be:

"OUR SCHOOLS—WHAT WE THINK OF THEM."

MAY.

13th—

"How we would deal with the Examination Problem." A Discussion by some Young People (Melbourne).

18th—

"The Winnetka Schools, Chicago." By Rev. C. T. Parkinson (Sydney).

20th—

"Would the Winnetka Plan Work in Australia?" A Discussion by some Young People (Melbourne).

25th—

"The Ideal School for Australia." By Rev. C. T. Parkinson (Sydney).

27th—

"Our Conception of an Ideal School for Australia." A Discussion by some Young People (Melbourne).

The Tropics and Man

Adventures in Science—The Discovery of Vitamins.

DOUGLAS H. K. LEE, M.Sc., M.B., B.S., D.T.M., Professor of Physiology, University of Queensland.

THE word "adventure" calls to mind swash-buckling privateers, storm-tossed voyagers, fever-ridden explorers in tropical forests, in hourly peril from savages or treachery. What place is there in this reckless, glorious living for the cool calculated pursuit of scientific discovery? What matter the shadowy truths of an unseen, ill-understood world when life turns on the accuracy of the native's aim, and the loyalty of hired bearers?

To the vast majority of these restless pioneers no doubt science, as such, was unknown, and yet, they depended upon the science of their time for their very lives—navigation and firearms were obvious examples if they had but thought of it. Nevertheless, true scientists were not wanting amongst these careless warriors, for science is not an exclusive possession to be purchased from special instructors, it is the product of a scientific mind, and anyone who takes the trouble to observe carefully, to consider his observations and their possible explanation, and to put his conclusions to the test of experiment has that mind, be he soldier, sailor—or thief.

Recognition of Deficiency Diseases.

In the writings of these scientist-pioneers are to be found from time to time accounts of diseases produced by lack of certain foods—deficiency diseases we call them to-day. The significance of many of these observations were not appreciated at the time, but bit by bit experience drove home the lesson and confirmed their statements.

In 1720 an Austrian physician, Kramer, wrote that 3 or 4 oz. of orange or lime juice would cure the dreadful disease of scurvy without other help. Captain Lind wrote a "Treatise on Scurvy" in 1757, giving for the first time the results of experiments conducted on sailors and proving that the disease was cured or prevented by the use of salads, summer fruits, &c., while Captain Cook was awarded the Copley Medal of the Royal Society for his dealings with scurvy in his famous voyages commencing in 1768.

Listen to these extracts from the writings of these voyagers and imagine yourself before the mast on the old windjammer.

Although the existence of two other diseases—beri-beri and rickets —had been known for a long time (beri-beri was described in the year 2600 B.C.), they were not recognised as deficiency diseases until much later. In 1878, 300 out of every 1,000 men in the Japanese navy were sick with beri-beri. In 1882 another sailor—Admiral Takaki—carved himself a niche in medical history, by abolishing beri-beri from the

Japanese navy in much the same way as James Cook and his contemporary navigators had banished scurvy from the British navy. There was one important difference, however, which was to prove the forerunner of our present-day concepts. Scurvy had been prevented by the addition of one specific item to the diet—lemon juice; beri-beri was stopped by substituting a mixed diet of vegetables, meat, fish and barley in the place of one consisting largely of rice. There was one other difference. Admiral Takaki lived to enjoy the material benefits of a peerage conferred upon him by a grateful Emperor.

Experimental Production of Deficiency Diseases.

In the history of almost any medical discovery, you will find that the first stage has been careful observation of what occurs in nature. The scientist notices that if certain things are done—or, as in the case of vitamins, not done—certain disease symptoms appear. From this knowledge, some sort of prevention or cure often springs—thus, to cure or prevent scurvy, it was found necessary to have fresh fruit and vegetables.

If knowledge remained at this stage, however, medicine would stay in a very rough and ready state. The next stage in progress is usually to see if one can produce and cure the condition at will, preferably in animals, but if that is not possible, it is sometimes necessary to use human beings. There have at all times been men of sufficient faith and nobility to offer themselves for such experiment—but that is another chapter of medical adventure.

In the case of the vitamins, the next step forward was taken almost accidentally. Eijkman, a Dutch scientist in Java, noticed in 1897 that when the hens in the prison yard were fed the same diet as the prisoners—polished rice—they also developed a kind of beri-beri, but when the hens' diet was changed, they got better. Here, he said to himself, is an opportunity to find out just what it is about the rice diet which produces beri-beri. Fowls are plentiful, they eat much less food and they do not suffer from so many diseases as man; they will make my work much easier. And so he and his colleagues set to work. Even so, it was nine years before they discovered the truth, that rice husks contain a substance which is essential for the heart and nervous systems, and that this substance is necessary if polished rice forms the major part of the diet.

Although the observation which started Eijkman off on his trail of discovery was an accident, the same "accident" must have happened hundreds of times before, but none had realised its meaning, and the opportunity awaited Eijkman's acumen. This happy "accident" in the case of beri-beri was followed in 1907 by an equally happy accident in respect of scurvy, this time at the hands of Norwegian investigators, and the guinea-pig was the animal. This was a very fortunate accident, as the guinea-pig is one of the few animals which do get scurvy, and the investigators were looking for beri-beri at the time.

Of the work of these Dutch and Norwegian scientists, English and American workers were daily bringing confirmation. Hopkins' account of his milk experiments published in 1912 have been described as ranking æsthetically beside the best short stories of H. G. Wells. He fed rats on a diet which should have been quite sufficient for them, but which consisted of highly purified foods. The rats refused to grow until a small portion of milk was added to the diet.

At this time, a Polish bio-chemist, Casimir Funk, was working in London, and showed that a substance which prevented beri-beri could be obtained in concentrated form from rice husks. He was an imaginative man and, thinking over all that had been written about beri-beri, scurvy, and the like, perceived a single principle behind them all. For the first time he put forward the idea that food, to be adequate to the body's needs, must contain more than carbohydrate, fat and protein—it must contain certain other substances which are only required in minute amounts, but which are essential for health. These substances he called vitamins. Thus Funk brought together into a single class governed by a single principle of prevention, diseases which were very different in their appearance. How true was Funk's flash of inspiration we now fully realise. Funk postulated four vitamins, we now recognise at least ten, and many others will probably soon be admitted to the fold.

The World War.

Just when scientists of all nations had crossed the threshold of a new discovery, a discovery of the greatest importance to all mankind, there came to the world those dread dark days of 1914 and the subsequent holocaust. The shrill of the bugle, the roll of the drum, merged with the reverberation of gun-fire to drown the silvery pipings of peace-time science. This was no time for the prosecution of obscure imaginings, it was far more important to invent new ways of killing men than of saving rats. Yet how completely was this titanic struggle to vindicate the scientists' contentions. Read accounts of the sufferings of those caught in the toils of the blockade, see their emaciated frames swelling with the dropsy of beri-beri, their gums bleeding from scurvy, infection of all kinds steadily mounting as the body's resistance drops, the collapse of morale and the outbreak of red revolution as the last glimmer of hope dies.

How right were the scientists with their stress on the importance of food and of the minute necessary factors of food—but what a price to pay for proof! A proud nation brought to its knees and the health of thousands upon thousands ruined. Here indeed was adventure—but disastrous adventure of the wrong kind. Once more Science had been pressed into the victor's service and her humanitarian gifts converted into a death-dealing weapon.

The Atonement.

People are fond of stressing this subjugation of Science to the art of destruction, but there is another side to the picture. It is undoubtedly true that the demands of war forced the development of very many scientific discoveries which would have lagged behind in peace. So also the catastrophe of war famine drove scientists to further efforts in their examination of foods, vitamins and other accessory factors, as they are called. But so vast is the knowledge, so delicate the technique required that the day of the brilliant individual discoverer is well-nigh over. One man, working alone, cannot examine his work from all the different angles which are necessary, and, in any case, what he could accomplish depends upon all the other discoveries which have gone before. In the place of a few inspired enthusiasts there is hardly a place of learning which has not its group of vitamin or other nutrition investigators.

It may seem to you that with this factory-like development of Science, that romance and adventure have become mere legends, that it is no longer possible to sail a valiant lone voyager on the uncharted seas of natural science. This is not necessarily true as I shall show in a minute, but first let me say a word or two as to where this team-work is taking us in the matter of vitamins.

The outstanding development is the increasing number of vitamins being accepted by even the most cautious scientists. There are a large number of others still on trial as it were. We can sympathise with the candidate who, being asked where the six B vitamins were to be found, replied, "In Professor Peter's brain, Sir!" What was formerly thought to be a single vitamin has more than once turned out to be two or more similar but distinct vitamins. Then new ones altogether have been discovered. To make matters worse, it is no longer possible to draw a sharp dividing line between vitamins and certain other food constituents.

The second outstanding point about recent developments is the stress laid upon the mixed or balanced diet. Vitamins are not things to be added to the diet out of a bottle; a well mixed diet, containing the different foods in the proper proportions or balance, will generally ensure that a sufficiency of all is obtained.

The third feature of modern work is the manufacture in the laboratory—synthesis, the chemists call it—of some of these vitamins. As much as 1 lb. of vitamin C has been manufactured at a time, but of this, the adult requires only one thousandth part of an ounce daily—1 lb. would last him forty-five years.

Modern Adventure.

As I mentioned before, you may feel that the days of adventure in Science are over. You may say that it was all very well for Captain Cook to notice that lemon juice prevented scurvy; all he had to do was to look; everything as simple as that has been found out already.

In the first place, I doubt whether everything that is observable has been observed. There is a vast difference between seeing and observing. In the second place, there is just as much adventure in complex science as in simple observation. Think of the thrill that must have come to Szent-Gyorgy when he first isolated vitamin C, or to the team of chemists who first manufactured it artificially. You can see them working away day after day, month after month, now trying this line of work only to meet with failure, now trying a different line, to fail again. Some member of the team lying awake at night turning the problem over and over, sees a suggestive link. He persuades his colleagues that it is worth following up. Is it worth while? Will it mean the dashing of yet another hope, the loss of more months of futile work? They try, they persevere. At last the final product! Will it work? Is it what they have been looking for? They give it to an animal with scurvy. Just imagine how anxiously they watch the animal, how fearfully they will go to its cage each morning. On the fourth day the animal is better, in two more it is cured—Eureka: We have found it!

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

Plants from Morven Named.

W.C.C. (Morven)—

(1) *Amphipogon sp.*—This is a very widely-spread grass in Western Queensland, particularly in the mulga country of the south-west, and in the sandy land of the central-west. It is sometimes known as Neverfail, at other times as Porcupine grass, but both these local names are applied to other grasses. It has little value as a fodder, although it is eaten in its younger stages of growth in the absence of more palatable feed.

(2) *Neurachne mitchelliana*, commonly known as the Mulga Mitchell, one of the best grasses of the Mulga country.

(3) *Danthonia bipartita*, a common grass of the Mulga country. We have not heard a local name applied to it. It should be quite a good fodder but we have no particular information about it.

(4) *Aristida anthoxanthoides*, a species of wire grass or three-prong spear grass. The wire grasses, on the whole, have little value as a fodder although stock will sometimes eat them in the absence of better feed.

Elephant Grass.

A.H.B. (Mount Ossa, Mackay)—

The specimen bore no seed heads but there is little doubt that it is elephant grass, *Pennisetum purpureum*, grown to a limited extent as a fodder in many parts of Queensland.

Elephant grass is not now grown to the extent that it was some years ago, probably owing to its very caney nature. Kept regularly cut, however, it is a useful grass for either feeding off or chaffing. It is not known to possess any poisonous or harmful properties at any stage of its growth.

"Fish Weed."

G.R.S. (Biggenden)—

The specimen is *Chenopodium triangulare*, a native plant sometimes seen in the ordinary pasture, but most frequent as a weed of cultivation, around cowyards, or where the ground has been disturbed. It is commonly called fish weed, due to the peculiar flavour and odour it gives to milk and cream.

"Devil's Claw."

W.D.R. (Springsure)—

The specimen is devil's claw, *Martignia lutea*, a native of South America, now fairly common in some parts of Australia. In Queensland, it is most abundant on the Darling Downs, particularly about Dalby, where it is sometimes known as pumpkin vine, from the pumpkin-like growth of the plant. It is also known as unicorn plant, elephant's trunk, and devil's grip. The seed vessels often become entangled in sheep's wool, particularly the neck wool, and their presence may not be discovered until shearing time, with consequent breakages of the teeth of the shears and temper of the shearers. The plant is an annual.

"Wild Grape." Pandanus.

W.R.H. (Gordonvale)—

The vine described and known about Cairns as wild grape, is, we think, *Vitis opaca*. This forms a very large tuber. The only thing that we cannot reconcile with your description is where you say that the vines have a few blunt spines on them here and there.

The *Archontophœnix Alexandræ*, which is very common in swamps near Cairns, we have always regarded as the same as that found on the hillsides at Freshwater Valley. The common pandanus about Cairns we are not too sure of. We have quite a number of species in Queensland. Your best plan is to send a few droops or "nuts" taken from under the trees.

General Notes

Staff Changes and Appointments.

The approval of the Executive Council has been given to the appointment of Mr. Robert Wilson, Assistant Under Secretary, to be Acting Under Secretary for Agriculture and Stock and Acting Director of Marketing in succession to the late Mr. E. Graham. Following his appointment as Acting Director of Marketing, Mr. Wilson will also be a member of all commodity boards established under "*The Primary Producers' Organisation and Marketing Acts,* 1926 *to* 1935," a member of the State Wheat Board, and also of the Committee of Direction of Fruit Marketing.

The appointment of Mr. H. P. N. Hindmarsh, "Wingfield," Monto, as an Honorary Acting Inspector of Stock at Rawbelle, has been cancelled.

Mr. T. W. Case, Ravensbourne, has been appointed an honorary ranger under the Native Plants Protection Act.

Mr. E. B. Rice, assistant analyst, Dairy Research Laboratory, has been appointed dairy technologist, Department of Agriculture and Stock.

Mr. S. H. Scougall, care of Plane Creek Mill, Sarina, has been appointed millowners' representative on the Plane Creek Local Sugar Cane Prices Board, vice Mr. A. Innes, resigned.

Mr. E. R. Hollamby, inspector of slaugherhouses, Maryborough, has been appointed also an inspector under the Diseases in Stock Acts and the Brands Acts.

Constable W. S. Johnson, Bowen, has been appointed also an inspector under the Brands Acts, and Constable W. Kearney, of Mitchell, an inspector under the Slaughtering Act.

Mr. R. T. Smith, Bingera Sugar Mill, via Bundaberg, has been appointed millowners' representative on the Bingera Local Sugar Cane Prices Board, vice Mr. A. J. Gibson, resigned.

Messrs. A. J. Anders (Maroon, via Boonah), A. G. Maddox (Clumber), A. J. D. Philp (Wyaralong), and J. Stenzel (Mount Alford) have been appointed honorary protectors under "*The Fauna Protection Act of* 1937."

Diseases in Plants Inspectorships.

An examination for inspectorships under "*The Diseases in Plants Acts,* 1929 *to* 1937," will be held in Brisbane and principal towns of the State on Monday, 25th, and Tuesday, 26th July next. The estimated number of vacancies for which qualified men will be required is three.

Application forms and a copy of the Regulations containing a list of the subjects in which candidates will be examined may be obtained from the State Public Service Commissioner's Department, Brisbane.

The prescribed text-books are:—

"Insect Pests and their Control, and Plant Diseases and their Control"; and

"Principles of Botany for Queensland Farmers."

These publications may be obtained on application to the Under Secretary, Department of Agriculture and Stock.

Those candidates who succeed in obtaining the requisite minimum number of marks for the written portions of the examination will subsequently be required to undergo *viva voce* tests and, before appointment, successful candidates will be required to pass a medical examination. No person will be appointed who is not competent (or willing to learn) to ride a horse or a motor-cycle.

Applications for admission to the examination, together with the fee of 15s., must be received by the Acting Secretary to the Public Service Commissioner, Box 488H, G.P.O., Brisbane, not later than 4th June, 1938.

Rural Topics

Technologist to Lecture to Queensland Dairy Farmers.

Mr. E. Brooke Rice, a young Queenslander who is one of the technologists in the Department of Agriculture and Stock, and who returned recently from England after a twelve-months' course at the famous Reading Dairy Research School, and who visited Denmark, Holland, Germany, and other European countries while he was abroad, will shortly commence an educational lecture programme. Mr. Rice will visit the chief dairying centres of the State, starting off in the Darling Downs division. His lectures, illustrated profusely with lantern slides, have been prepared with the object of encouraging dairy farmers to aim at producing the choicest quality butter. This is part of a general educational scheme planned by the Minister for Agriculture and Stock (Mr. Frank W. Bulcock) for the purpose of helping the dairy industry to maintain its footing on the Imperial market—an object which can only be realised if the industry exports butter—and cheese, too—of the quality required by British consumers.

Queensland Products at the Sydney Show.

The Queensland farming and forestry and Tourist Bureau exhibits attracted great public attention at the Sydney Show. There was always a large crowd about it and many interesting comments on the various displays were voiced. One amusing remark by a young fellow was heard. Turning to a friend he said, "There you are, Bill, I told you that pineapples don't grow under the ground. Look at that"—pointing to a pineapple on a plant in the fruit section of the Queensland exhibit.

A frequent question asked was whether cotton is grown by coloured labour in Queensland. The officers with the exhibit of the Department of Agriculture and Stock (Messrs. S. Burchill and J. H. Gregory), had the pleasure of telling inquirers that Queensland is the only country in the world exclusively employing white labour in the production of cotton—cotton, by the way, equal to the world's best.

Queensland-bred Wheat Awarded Commonwealth Championship.

With a sample of Flora variety, Mr. J. W. Wilson, of Gilgandra (N.S.W.), won the Commonwealth champion prize for medium-strong white wheat at the Sydney Royal Show.

In the championship class Mr. Wilson gained a total of 171½ points out of a possible 200. For grain quality he was awarded 53½ points out of a possible 60, and for milling 118 out of a possible 140. The wheat, which was sown on black semi-mulching soil, weighed 66½ lb. to the bushel. It yielded 11 bushels to the acre, and the rainfall during growth was only 2.10 inches. Seed at the rate of 50 lb. per acre was sown on fallow.

The Flora variety of wheat was bred at the Roma State Farm by Mr. R. E. Soutter, Research Officer, Department of Agriculture and Stock. It is a result of the crossing of the Bobs and Florence varieties. Flora covered the second largest wheat acreage in Queensland in the 1936-7 season. A sample once scaled 69¼ lb. to the bushel. Numerous prizes have been won in Queensland with this variety.

The Cause of Erosion.

A lot is heard about soil erosion and washaways these days, and there is no doubt that it is a serious matter from both the farmer's and the State point of view. A committee has been investigating the trouble in Victoria, and has arrived at the conclusion that there is no single cause of soil erosion; neither is there one sovereign remedy. In the final analysis, the real cause of soil washing must be admitted and that the cause is the mistreatment of the soil and other natural resources by man himself. We are all trying to get from our soil—and also from our timber lands—the highest return in the shortest time. To be quite fair to ourselves, however, it must be said that most of the damage to our farming land is done unwittingly, or, at least, because of our lack of knowledge of how to prevent or correct erosion. To plead ignorance of the laws of nature is, however, as useless as pleading ignorance of the laws of the land. In both cases, we cannot dodge the penalty. The remedy is to study causes of soil washing on our own farms and in our own locality, so that, at least, something may be done in the way of minimising the damage.

Whitewashes for Farm Use.

Whitewash has a wide application to farm use and deserves a much greater popularity than it at present enjoys. Its ingredients are inexpensive and readily obtained; it is not difficult to make, and it is easy to apply it. In addition to these advantages, it protects the surfaces to which it is applied, brightens up dark interiors, and is sanitary. A fact not generally known is that whitewash may be coloured provided that light tints and shades are used and that the pigments aren't affected by lime. Among such are yellow ochre, raw and burnt umber, and raw and burnt sienna.

How to Use Whitewash.—The surface to be whitewashed should be just as clean as one that is to be painted, and it is a first essential to good results that all dirt, dust, grease, and scaly material be removed before there is any attempt to apply the wash. This implies a liberal use of scrapers and stiff brushes. When the cleaning is finished and the surface dusted, it is well to dampen it slightly just before applying the wash.

Whitewash may be applied with the brush or sprayer. In applying with the brush, use one at least 4 inches wide, and work rapidly, making no attempt to "brush out" as in painting. Let the coat be fairly thin and transparent, and it will be opaque when dry. Small hand or power sprayers may be used. In using sprayers it is quite necessary that the wash be strained through at least two thicknesses of cheesecloth.

Spraying has many advantages over brushing under certain conditions, and it forces the material into cracks and crevices that would not be reached by the brush. In using the sprayer always hold the nozzle so that the wash is applied at right angles to the surface; this gives even application. The sprayer should be thoroughly cleaned after use, and especially the nozzles, as a small particle of dirt clogging one side of the nozzle will cause it to send out a lopsided stream and the work will be patchy.

Estimating Quantities.—In estimating the quantity of material required many problems and conditions are encountered, but the following general figures may be used as a basis. One gallon of whitewash will cover approximately 225 square feet of wood, 180 square feet of brick, and 270 square feet of plaster. Using a 4-inch bruch, a man will cover 200 square feet of ceiling, 200 square feet of rough wall, or 350 square feet of smooth wall in one hour.

How to Make Whitewash.—(*a*) Prepare the lime and water paste a few days before you wish to use it.

(*b*) Where casein, glue or formaldehyde are to be used, the solutions must be brought together only when they are quite cold. This is very important.

(*c*) The solutions mentioned in (*b*) should be added quite slowly and at the same time they should be stirred vigorously and constantly.

(*d*) In no case should you mix more of the wash in one day than you can use in that day when any of the solutions mentioned in (*b*) are used.

(*e*) Skim milk may be used as a substitute for casein, but it is not quite so effective.

(*f*) In place of one sack (50 lb.) of hydrated lime, you may use the paste made by slaking one-half bushel (38 lb.) of fresh quicklime with about 6 gallons of water. This slaking is sometimes done by placing the quicklime in a barrel and adding the water boiling hot. If cold water is used the water may be added a little at a time, stirring each time; when heat ceases to be given off the lime is slaked.

Before using, strain this paste through a fine screen.

(*g*) Alum tends to prevent rubbing, and is used in proportion of 1 oz. to 1 gallon of the wash. It would not be needed in the formulæ C, D, or E given below.

(*h*) If a gloss is desired, dissolve 1 lb. of bar soap in a gallon of boiling water, and when it is cold add it to 5 gallons of the thick wash.

Some Common Formulæ.—A. (1) Dissolve 15 lb. of common salt in 7½ gallons of water. (2) Slowly add one sack of hydrated lime, stirring vigorously. (3) Thin this to milk-like consistency with water.

B. (1) Make a paste of one sack of hydrated lime and 7 gallons of water. (2) Dissolve 1 lb of common salt and ½ lb of zinc sulphate in 1 gallon of boiling water. Allow this to cool. (3) Pour this last solution into the lime paste solution a little at a time, stirring vigorously. (4) Stir in 2 gallons of skim milk.

C. (1) Soak 5 lb. of casein in 2 gallons of hot water for two hours. (2) Dissolve 3 lb. of trisodium phosphate in 1 gallon of water. (3) Mix these two and allow

the casein to dissolve and cool. (4) Make a cream of one sack of hydrated lime and 7 gallons of water. (5) Slowly add (3) to (4), stirring vigorously. (6) Just before using, dissolve 3 pints of formaldehyde in 3 gallons of water and add it very slowly to (5), stirring vigorously. Do not mix more than can be used in one day.

D. (1) Soak 5 lb of casein in 2 gallons of hot water for two hours. (2) Add 3 pints of household ammonia to 1 gallon of water. (3) When cold mix (1) and (2). (4) Make a cream of one sack of hydrated lime and 7 gallons of water. (5) Slowly add (3) to (4), stirring vigorously. (6) Just before using dissolve 5 pints of formaldehyde in 3 gallons of water and add it very slowly to (5), stirring vigorously. (7) Thin to a milk-like consistency.

E. (1) Dissolve 3 lb. of glue in 2 gallons of hot water and allow to cool. (2) Make a cream of one sack of hydrated lime and seven gallons of water. (3) Mix (1) and (2), stirring vigorously. (4) Thin to a milk-like consistency.

F. (1) Make a cream of 1 sack of hydrated lime and 8 gallons of water. (2) Slowly add 1 quart of crude carbolic acid, stirring vigorously. The quantity of acid may be doubled if desired. (3) Thin to a milk-like consistency.

G. (1) Make a cream of 1 sack of hydrated lime and 7 gallons of water. (2) Dissolve 6 lb. of salt in 3 gallons of boiling water. (3) Mix (1) and (2) when cold. (4) Stir 3 lb. of Portland cement into (3).

Uses for the Different Formulæ.—Formulæ A and B: Unimportant outdoor work, sheds, fences, and trees. C and G: Higher grade of work on dairies, buildings, and trees. D: Basements that tend to be damp. E: Dry basements. F: As a disinfectant wash but liable to rub.

Flushing the Separator.

The test or percentage of fat required in cream should be not less than 38 per cent. during the hot summer months and not less than 34 per cent. during the cooler months of the year. Whatever make of separator is used, during the process of separating satisfactory results can only be obtained when the cream screw is adjusted so that the driven speed of the separator conforms with the corresponding number of revolutions per minute recommended by the maker of the machine.

At the completion of separating, flushing with cold or warm water so as to remove the last of the cream from the patties is an undesirable practice. If the cream bucket is not removed during the process, some of the impurities and slime adhering to the bowl may be removed and deposited in the cream. This applies particularly if warm water is used. When separated milk is used for flushing, excessive milk solids are introduced into the cream, and these will act as a starter and affect the quality. Thus the proceeds of flushing should be fed to the pigs or calves on the farm. The maintenance of cream quality is too important to be impaired by laxity in this respect.

Wholesome Milk.

Normal milk can only be produced by a normally healthy herd, fed on wholesome and non-taint producing fodders. If only one cow in the herd is not in normal health her milk production will be sub-normal, and, if mixed with the milk from the remainder of the herd, the quality of the whole may be seriously affected. Cleanliness should be exercised during the whole process of milking, and all utensils and surroundings kept clean.

If the milk is intended for human consumption, cooling and aerating will allow the feed flavours to be given off, and the reduction in temperature will check bacterial development.

Isolation Pen for Sick Pigs.

The distance between isolation pens for sick pigs and the pig yards or dairy structures is not so important as the relationship of these structures from another point of view. Thus, while advising a minimum distance of, say, 150 feet, it should be emphasised that such isolation pen should be so placed that:—

(*a*) No drainage from it can spread to the main sties or any of the dairy buildings; and

(*b*) That if healthy pigs are allowed to wander, the isolation pen should be so guarded that they cannot make contact with it.

Ordinarily, therefore, the isolation pen should be on lower ground, and, if in the paddock in which pigs wander, should be protected by fencing in such a way that healthy pigs cannot come in contact with it.

Orchard Notes

JUNE.

THE COASTAL DISTRICTS.

IF the weather is dry, citrus orchards should be kept in a good state of tilth and any winter green manure crops turned under. Old worn-out trees may be dug out and burnt. Custard apples will be ripening more slowly as the nights get colder. If the weather becomes unduly cold, or if immature fruit is sent South, the fruit is apt to turn black and become valueless. Grade custard apples carefully, and pack in cases holding a single layer of fruit only for the Southern markets.

The pineapple plantation should be shallow worked and kept free from weeds. The fruit takes longer to mature at this time of the year; consequently it can be allowed to remain on the plant until partly coloured before gathering for the Southern markets.

Banana plantations also should be kept worked and free from weeds, especially if the weather is dry, as a severe check to the plants now may mean small fruit later on. Bananas should be allowed to become full before the fruit is cut. The necessity of proper handling, grading, and packing of the fruit should be kept in mind. Land intended for planting with bananas or pineapples during the spring should be got ready now.

Strawberries require constant attention, and unless there is a regular and abundant rainfall, they should be watered regularly. Where not already done, vineyards should be cleaned up ready for pruning. It is, however, too early to prune or to plant out new vineyards.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

ALL kinds of deciduous fruit trees are now ready for pruning, and this is the principal work of the month in the orchards of the Granite Belt area. Thin out young trees properly, and cut them back hard. Many good trees are spoilt by insufficient or wrong pruning during the first three years. If in doubt as to the correct method of pruning consult the district instructor in fruit culture. In old orchards, do not have too much bearing wood; cut out severely, especially in the case of peaches. Planting may be commenced where the land is ready as early-planted trees become well established before spring, and thus get a good start. When land is intended for planting this season, see that it is well prepared and well sweetened before the trees are put in, as young trees seldom make a good start when planted in sour or badly prepared land.

Slowly acting manures—such as bonedust, meatworks manure, or phosphates—may be applied now, as they are not liable to be washed out of the soil, and they will be available for the use of the trees when they start growth in spring. Lime may also be applied where required. Badly drained land should be attended to, as no fruit trees will thrive with stagnant water lying round their roots.

On the Downs and Tableland all kinds of fruit trees may be pruned now, and vines also may be pruned in any district where there is no risk of late frosts. Prunings should be gathered and burnt, and the vineyards ploughed up and well worked to reduce the soil to a good state of tilth, so that should rain come it will absorb all that falls and the moisture can be kept in the soil by cultivation subsequently.

Citrus fruits will be at their best in the western districts. The trees should be watered if they show signs of distress; otherwise all that is necessary is to keep the surface of the land well worked. All main-crop lemons should have been picked by this time.

BULL RECORDING.

As every breeder knows, it is not always what an animal appears to be, but what class of animal it breeds that really matters. We should, therefore, attempt to record all our bulls (on the average yield of their daughters) and give them a figure for milk yield in the same way as we do for cows.—*Dr. John Hammond.*

Farm Notes

JUNE.

FIELD.—Winter has set in, and frosts will already have been experienced in some of the more exposed country of the Maranoa and Darling Downs. Wheat sowing should now be in full swing. Full directions for "pickling" seed wheat are available on application to the Department of Agriculture, Toowoomba. Land intended for the production of early summer crops may now receive its preliminary preparation, and every opportunity taken advantage of to conserve moisture in the form of rainfall where experienced; more particularly so where it is intended to plant potatoes or early maize. Where frosts are not to be feared the planting of potatoes may take place in mid-July; but August is the recognised month for this operation. Arrowroot will be nearly ready for digging, but we would not advise taking up the bulbs until the frosts of July have occurred. Take up sweet potatoes and ginger. Should there be a heavy crop, and consequently a glut in the market, sweet potatoes may be kept by storing them under cover and in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe and will rot or dry up and shrivel in the sand pit. Before pitting, spread the tubers out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand; then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them; then put down another layer of tubers, and repeat the process until the hill is of the requisite size, and finally cover with either straw or fresh hay. The sand excludes the air, and the potatoes will keep right through the winter.

Cotton crops are now fast approaching the final stage of harvesting. Growers are advised that all bales and bags should be legibly branded with the owners' initials. In this matter some consignors are careless, causing much delay and trouble in identifying parcels, which are frequently received without address labels.

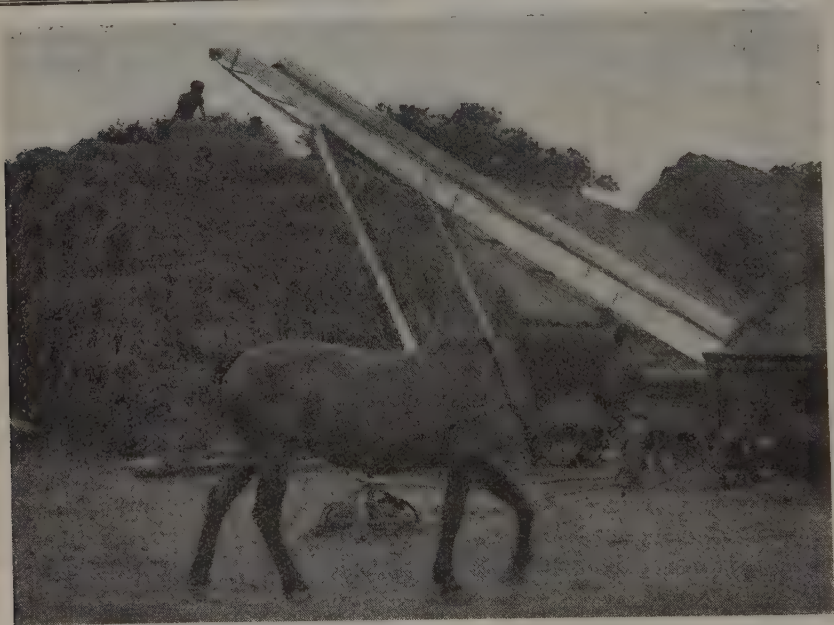
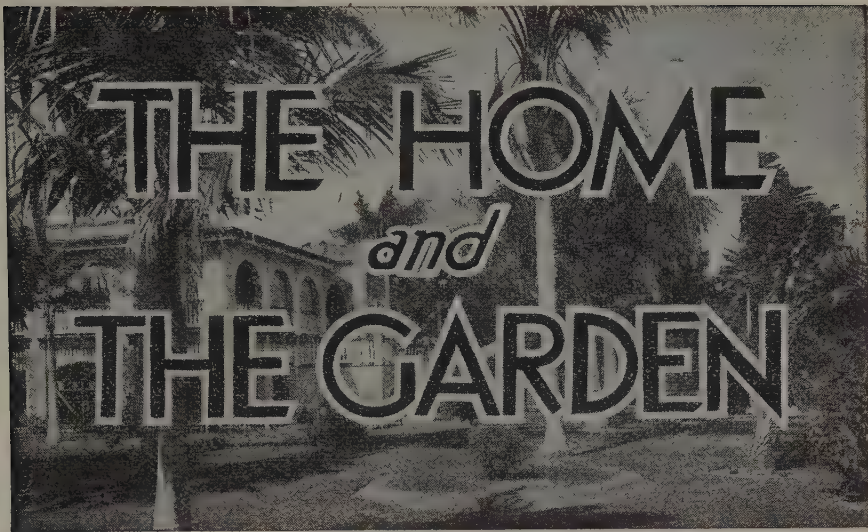


Plate 186. [*Photo.: L. F. Anderson.*

STACKING HAY ON AN ENGLISH FARM.—The hay is tied in bundles by machinery and carried on to the stack, a horse-gear providing the power.



Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

HEALTHY MOTHERHOOD.

Australia wants healthy babies—all and more than those arriving at present.

The first requirement of a healthy baby is healthy parentage, but as important as this undoubtedly is, it is only a beginning. There is now a much wider diffusion of knowledge regarding midwifery amongst the general public. There are now many women who know much more about themselves than their mothers ever knew, who demand—and rightly—that they shall be helped to go through the strain, in some cases the danger, and in all cases the irksomeness of bearing children with complete safety and with as much comfort as medical knowledge can give.

The unborn baby can be reached only through the mother who carries it. So the life of the child and the life of the woman in pregnancy are closely bound together and depend one on the other. Although the baby is hidden from sight it is possible, through the mother, for it to be influenced for good or ill. So it is clear that ante-natal care is the care of the expectant mother in health and disease and the care of the child before it is born.

Bearing this in mind the expectant mother should, early in her pregnancy, put herself under the care of her doctor or pay a visit—the first of several it is hoped—to an ante-natal clinic. She should welcome the medical examination which is made, both for the sake of her general health and for the prevention of any discomforts associated with her pregnancy and of any dangers to herself and her child. She should

realise too that in having her urine tested and blood pressure taken at each visit, a very important part is played in keeping guard over her health, for by these tests early signs of danger are found.

Even a woman in apparently good health may develop kidney trouble which, if recognised early, makes it possible for steps to be taken by her doctor so that her pregnancy may be brought to a safe and happy conclusion.

The teeth of the expectant mother should be carefully examined, for no one with defective teeth can satisfactorily digest food—entirely apart from poisons which may be absorbed from infected gums.

Her diet is of the greatest importance. Many women neglect to take suitable food for the development of a strong healthy baby.

One of the greatest advantages an expectant mother derives from obtaining advice in good time is peace of mind. She will know what she may safely do and will be able to do it without worry. She will feel that someone outside the family, who knows exactly what she needs, is sharing her responsibility, and that she is doing what is right for herself and her unborn child.

She should always report at once to her doctor or ante-natal clinic if at any time during her pregnancy she notices—

Persistent headache,
Dimness of vision,
Diminution in quantity of urine,
Frequency of passing urine,
Swelling of the feet and legs,
Pains in the abdomen,
Persistent vomiting,
Discharge of blood from the vagina.

It is well known that the new baby is cared for at the ante-natal clinics, but not realised by many that the care of the mother should not cease at the end of the lying-in period. She should present herself to her doctor or the clinic which she attended before the birth of her child for a post-natal examination—which means that about six weeks after her confinement she should be examined to see that her organs are again in their right position. So frequently simple treatment prescribed by her doctor can prevent small troubles developing into big ones which may in the end need operation to restore her to comfort and good health.

IN THE FARM KITCHEN.

THE EVER USEFUL EGG.

Eggs Chasseur.

Take 4 eggs, 1 tablespoonful butter, 2 tomatoes, 2 tablespoonfuls grated cheese, 1 small onion, 2 rashers bacon, ½ lb. potatoes, pepper and salt to taste.

Melt the butter in a saucepan. Add peeled and diced onion and fry lightly, then add diced bacon. Cook till well browned. Add peeled and diced potatoes and chopped, peeled tomatoes. Cover and simmer until potatoes are soft. Meanwhile, poach eggs and stir grated cheese into the mixture. Season to taste with pepper and salt, if required, and pour into a shallow, hot dish. Arrange eggs neatly on top.

Egg and Shrimp Toast.

Take 8 rounds fried bread, 2 oz. butter, 1 small pot shrimp paste, 3 hard-boiled eggs, a little chopped parsley.

In smoking hot fat fry bread until golden brown. Drain on paper. Mix shrimp paste, egg-yolks, and butter together, and rub through a sieve. Rub whites of eggs through a sieve. Chop parsely very finely. Put shrimp mixture in a forcing tube and decorate edge of toast thickly with it. Fill up centre with whites of eggs and garnish with parsley. Serve hot or cold.

Eggs St. Michel.

Take 3 hard-boiled eggs, grating of nutmeg, 2 tablespoonfuls butter, 3 tablespoonfuls chopped fried mushrooms, 1 egg-yolk, 1 small cupful milk, ¼ teaspoonful salt, 2 tablespoonfuls flour, 1 tablespoonful minced parsley. Fried bread to serve.

Melt the butter in the top of a double boiler. Stir in flour, and when well blended gradually stir in milk, warmed till tepid. Stir constantly until sauce is smooth and boiling, then add chopped eggs, lightly fried mushrooms, parsley, and seasoning, and, when thick, the beaten egg-yolk. Pile mixture on slices of fried bread or hot buttered toast.

Eggs with Sauce.

Take 2 onions, 3 oz. butter, pepper, and salt, 1 tablespoonful vinegar, breadcrumbs, new-laid eggs.

Thinly slice the onions and fry until brown in 2 oz. of butter. Add vinegar, and cook for 3 minutes. Butter an earthenware baking dish. Place in it the fried onions and vinegar. Break the eggs separately, allowing one to each person, and put them, one at a time, over the onions. Sprinkle with pepper and salt. Add a thin layer of breadcrumbs, and bake in a hot oven until the eggs are set.

Eggs and Tomatoes.

Take the required number of fresh eggs, firm tomatoes, slices of fried bread, salt and pepper, salad.

Cut a slice off the end of each tomato, scoop out some of the pulp, and season the inside of the tomatoes with salt and pepper. Into each one carefully break an egg, put on the lids, and bake in a moderately hot oven until the eggs are set. When cold, serve garnished with salad.

Coddled Egg.

Take 1 new-laid egg.

Place the egg in boiling water, put on the lid, and let the saucepan stand for seven or eight minutes, when the water will keep hot without simmering. An egg cooked this way is more easily digested than when boiled in the ordinary way.

Poached Eggs a la Princesse.

Take 4 new-laid eggs, 4 round slices of bread (fried in butter), 1 dessertspoonful grated cheese, seasoning of pepper and salt, a little liquid butter. For poaching: 1 dessertspoonful vinegar, 1 teaspoonful salt, 1 pint water. Let the vinegar, salt, and water boil sharply, slip in eggs from a cup, let water reboil, lower heat, and simmer gently for three or four minutes; this should keep eggs a good shape. Take out with a slice, drain on a cloth, and trim neatly. Put each egg on toast, shake over a little cheese, season to taste, sprinkle with a few drops of liquid butter, and slip under the grill a minute until cheese is just melting and lightly brown.

Anchovy Eggs.

Take 6 eggs, 4 oz. butter, ¼ teaspoonful lemon juice, 1½ tablespoonfuls anchovy sauce, salt and pepper, lettuce, tomatoes for garnishing.

Boil the eggs hard and cut them in half lengthways. Remove the yolks and beat up with butter, lemon juice, pepper, and anchovy sauce. When thoroughly mixed, return to the prepared egg-whites and arrange on a bed of fresh salad and garnish with tomatoes.

Eggs with Irish Puree.

Take 6 hard-boiled eggs, 1½ gills milk, ½ oz. flour, ¾ oz. butter, 1 onion, 1 peeled potato, minced parsley, seasoning.

Melt the butter in a saucepan. Add peeled and sliced onion. Fry for ten minutes, stirring frequently. Add flour, and, when frothy, stir in the milk and sliced potato. Bring to the boil. Season to taste with salt and pepper. Cover and simmer for half an hour or until tender, stirring occasionally. Rub through a sieve on to a hot dish. Arrange eggs and sprinkle with parsley.

Scrambled Eggs and Asparagus.

Take 1 teacupful asparagus-tops, 1½ oz. butter, 2 slices toasted bread, 4 eggs, ½ gill cream, salt, pepper, and a little grated nutmeg.

Cut the asparagus tops in pieces about half an inch long; cook well in salted water with one teaspoonful sugar; when done, drain, then re-heat in a little butter. Beat eggs, add cream, and season with salt and pepper and grated nutmeg. Put 1 oz. of butter in a small saucepan, melt, and add egg mixture. Stir continually with a wooden spoon; as soon as it thickens, add asparagus tops; mix carefully and serve on neatly-trimmed pieces of toast. If tinned asparagus is used, merely cut off the tops and re-heat in the butter; the remainder may be used for a white soup.

Some Ways with Eggs.

1. Poach or steam. Serve one per person on a cake of boiled rice, seasoned to taste, and moistened with bacon fat.

2. Serve poached or steamed eggs on a fillet of smoked fish.

3. Serve a steamed or poached egg, allowing one per person, on a round of fried bread, spread with potted ham or fish paste.

4. Scramble eggs, allowing one per person. Add a teaspoonful of milk and a teaspoonful of butter or margarine to each egg. Serve with grilled gammon rashers or fried sausages.

A NEW BOOK ON QUEENSLAND BOTANY.

Principles of Botany for Queensland Farmers. By C. T. White, Government Botanist. (Issued by direction of the Hon. F. W. Bulcock, Minister for Agriculture and Stock.) Government Printer, Brisbane; pp. 232, plates 103. Price, 2s.

When the Government Botanist's articles on the principles of botany for Queensland farmers were appearing serially in the *Queensland Agricultural Journal* last year numerous enquiries as to when they would be published in book form were received. They have now been issued in the form of a small volume, available at 2s. a copy.

Botany is one of the most fascinating and at the same time useful of the natural sciences, of which even a little knowledge makes every place of interest. It also helps towards a proper understanding of the needs of plants.

In his *Principles of Botany for Queensland Farmers*, Mr. Cyril White has produced a work that should go far in assisting Queenslanders towards a knowledge and proper appreciation of the rich native flora of the State. The book is divided into five parts. The first part deals with the morphology or the study of the form and external appearances of plants; the second with the anatomy or the internal structure of the plant organs; the third with physiology or the study of the various life processes of the plant, particularly the two great factors of nutrition and reproduction; the fourth with the classification of plants or their arrangement into groups according to their natural affinities; and the fifth with distribution and the various plant associations of Queensland.

The volume is profusely illustrated with photographs of common Queensland plants, both native and cultivated. It is the standard text-book set for the examination for the appointment of inspectors under the Diseases in Plants Acts, and is obtainable from the Under Secretary, Department of Agriculture and Stock.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

Table showing the Average Rainfall for the Month of March, in the Agricultural Districts, together with Total Rainfall during 1938 and 1937, for Comparison.

Divisions and Stations.	Average Rainfall. Mar.	Average Rainfall. No. of years' records.	Total Rainfall. Mar., 1938.	Total Rainfall. Mar., 1937.
North Coast.	In.		In.	In.
Atherton	8·72	37	1·46	7·45
Cairns	18·06	56	3·61	15·80
Cardwell	15·87	66	1·39	32·23
Cooktown ..	15·30	62	2·07	17·75
Herberton ..	7·74	52	0·65	6·38
Ingham	16·08	46	5·77	33·74
Innisfail	26·73	57	11·10	48·99
Mossman Mill ..	18·15	25	0·97	19·98
Townsville ..	7·20	67	1·64	9·74
Central Coast.				
Ayr	6·48	51	1·90	9·63
Bowen	5·78	67	7·93	6·98
Charters Towers ..	3·75	56	4·21	6·30
Mackay	12·07	67	20·06	21·19
Proserpine ..	12·51	35	13·97	24·88
St. Lawrence ..	5·19	67	11·26	10·59
South Coast.				
Biggenden ..	3·94	39	6·76	14·95
Bundaberg ..	5·18	55	8·61	16·60
Brisbane	5·62	86	4·24	7·26
Caboolture ..	7·48	51	8·98	9·15
Childers	4·65	43	8·79	17·95
Crohamhurst ..	11·00	45	10·89	14·17
Esk	4·67	51	4·72	9·38
Gayndah	2·99	67	4·05	5·36
Gympie	6·19	68	5·87	16·87
Kilkivan	3·86	59	3·57	9·82
Maryborough ..	5·86	67	8·72	13·03
Nambour	9·25	42	12·32	19·77
Nanango	3·34	56	4·60	6·74
Rockhampton ..	4·36	67	8·83	7·37
Woodford ..	7·70	51	10·00	8·67

Divisions and Stations.	Average Rainfall. Mar.	Average Rainfall. No. of years' records.	Total Rainfall. Mar., 1938.	Total Rainfall. Mar., 1937.
Central Highlands.	In.		In.	In.
Clermont ..	3·07	67	2·10	4·06
Gindie	2·59	39	..	3·45
Springsure ..	2·88	69	4·75	3·64
Darling Downs.				
Dalby	2·67	68	3·94	6·92
Emu Vale ..	2·27	42	2·20	4·11
Hermitage ..	2·06	32	2·73	5·34
Jimbour ..	2·48	50	5·73	4·96
Miles	2·68	53	2·24	6·79
Stanthorpe ..	2·62	65	0·71	4·52
Toowoomba ..	3·72	66	3·90	9·84
Warwick ..	2·47	73	0·66	6·94
Maranoa.				
Roma	2·64	64	1·28	7·32
State Farms, &c.				
Bungeworgorai ..	1·82	24	..	6·15
Gatton College ..	3·05	39	2·30	7·12
Kairi	..	..	..	..
Mackay Sugar Experiment Station	11·10	41	17·82	18·03

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—MARCH, 1938.

Compiled from Telegraphic Reports.

Districts and Stations.	Mean Atmospheric Pressure. at 9 a.m.	Shade Temperature. Means. Max.	Shade Temperature. Means. Min.	Shade Temperature. Extremes. Max.	Extremes. Date.	Extremes. Min.	Extremes. Date.	Rainfall. Total.	Rainfall. Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·77	87	76	92	27	70	14	207	8
Herberton	..	82	62	88	17	55	1, 14, 30	65	5
Rockhampton	29·88	89	72	101	14	66	16	883	12
Brisbane	29·99	83	67	91	15	60	15	424	15
Darling Downs.									
Dalby	29·98	88	62	96	4	45	15	394	6
Stanthorpe	..	79	56	90	8	35	15, 16	71	7
Toowoomba	..	79	60	90	17	43	15	390	14
Mid-Interior.									
Georgetown	29·81	94	69	97	13, 16, 17,18,19	63	1	132	2
Longreach	29·86	97	68	103	13	58	16	17	2
Mitchell	29·94	89	62	100	4	43	15	78	4
Western.									
Burketown	29·81	98	74	102	20	68	19	Nil	
Boulia	29·87	98	72	106	3, 12	61	15	2	1
Thargomindah	29·87	96	70	109	5	53	16	2	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	May. 1938.		June. 1938.		MOONRISE. May. 1938.	MOONRISE. June. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m
1	6·18	5·20	6·36	5 2	7·3	8·58
2	6·18	5·19	6·37	5·2	8·8	9·46
3	6·19	5·18	6·37	5·2	9·13	10·32
4	6·20	5·17	6·38	5·2	10·11	11·12
5	6:20	5·17	6·38	5·2	11·3	11·51
						p.m.
6	6 21	5·16	6·39	5·2	11·50	12·30
7	6·21	5·15	6·39	5·2	12·34	1·7
8	6·22	5·14	6·40	5·2	1·13	1·42
9	6·22	5·14	6·40	5·3	1·51	2·21
10	6·23	5·13	6·41	5·3	2·29	3·5
11	6·24	5·12	6·41	5·3	3·14	3·44
12	6·24	5·11	6·41	5·3	3·43	4·30
13	6·25	5·11	6 42	5·3	4·22	5·21
14	6·26	5·10	6·42	5·3	5·3	6·10
15	6·26	5·10	6·42	5·3	5·48	7·5
16	6·27	5·9	6·43	5·4	6·35	7·56
17	6·27	5·9	6·43	5·4	7·25	8·48
18	6·28	5·8	6·43	5·4	8·18	9·40
19	6·29	5·8	6·43	5·4	9·10	10·34
20	6·29	5·7	6·44	5·4	10·1	11·27
21	6·30	5·7	6·44	5 5	10·53	..
						a.m.
22	6·31	5·6	6·44	5 5	11·47	12·22
23	6·31	5·6	6·44	5·5	..	1·22
					a.m.	
24	6·32	5·5	6·44	5·5	12,42	2·22
25	6·32	5·5	6·45	5·5	1·37	3·28
26	6·33	5·4	6·45	5·5	2·36	4·26
27	6·34	5·4	6·45	5·6	3·37	5·37
28	6·34	5·3	6·45	5·6	4·41	6·38
29	6·35	5·3	6·45	5·6	5·56	7·33
30	6·35	5·2	6·45	5·6	6·54	8·23
31	6·36	5·2			7·56	

Phases of the Moon, Occultations, &c.

7th May ☽ First Quarter 7 24 a.m.
14th „ ○ Full Moon 6 39 p.m.
22nd „ ☾ Last Quarter 10 36 p.m.
29th „ ● New Moon 11 59 p.m.

Perigee, 2nd May, at 11.0 p.m.
Apogee, 18th May, at 7.0 p.m.

Very seldom a so-called black eclipse occurs; as a rule, even at totality, a copper-coloured light predominates, more or less luminous according to the condition of the atmosphere in which the Sun's rays are refracted, bent inward. It may be as colourful, in various shades of red and silvery-grey, as a total eclipse in Queensland some years ago. At the greatest phase, 8.43, the stars may shine out brilliantly until 9 min. past 9 o'clock, when the light that rules the night emerges from the last vestige of dark shadow.

Throughout this month Venus and Mars will be very near each other, especially on the 8th, when they will set almost at the same time.

On the 19th, Mercury will reach its greatest distance west of the Sun, 26 deg. It will rise at 5.15 1 hr. and 14 min. before the Sun.

At the end of the month Jupiter may be called an evening star, rising at 11 p.m. among the small stars of Aquarius.

In the early evening the ecliptic may be traced from north-west to the south-east by Venus and Mars, by Regulus, in Leo, near the zenith, and Spica in Virgo south-east. The Centaur, the Southern Cross, and Argo Navis are enmeshed in the Milky Way, and while Orion is going down in the west the Scorpion rises in the east.

Mercury rises at 5.14 a.m., 1 hr. 3 min. before the Sun, and sets at 4.40 p.m., 41 min. before it, on the 1st; on the 15th it rises at 4.30 a.m., 1 hr. 56 min. before the Sun, and sets at 4.0 p.m., 1 hr. 10 min. before it.

Venus rises at 7.57 a.m., 1 hr. 39 min. after the Sun, and sets at 6.33 p.m., 1 hr. 13 min. after it, on the 1st; on the 15th it rises at 8.22 a.m., 1 hr. 56 min. after the Sun, and sets at 6.44 p.m., 1 hr. 34 min. after it.

Mars rises at 8.15 a.m., and sets at 6.47 p.m., on the 1st; on the 15th it rises at 8.4 a.m., and sets at 6.24 p.m.

Jupiter rises at 12.51 a.m., and sets at 1.54 p.m., on the 1st; on the 15th it rises at 12.6 a.m., and sets at 1.2 p.m.

Saturn rises at 4.9 a.m., and sets at 4.3 p.m., on the 1st; on the 15th it rises at 3.22 a.m., and sets at 3.12 p.m.

5th June ☽ First Quarter 2 32 p.m.
13th „ ○ Full Moon 9 47 a.m.
21st „ ☾ Last Quarter 11 52 a.m.
28th „ ● New Moon 7 10 a.m.

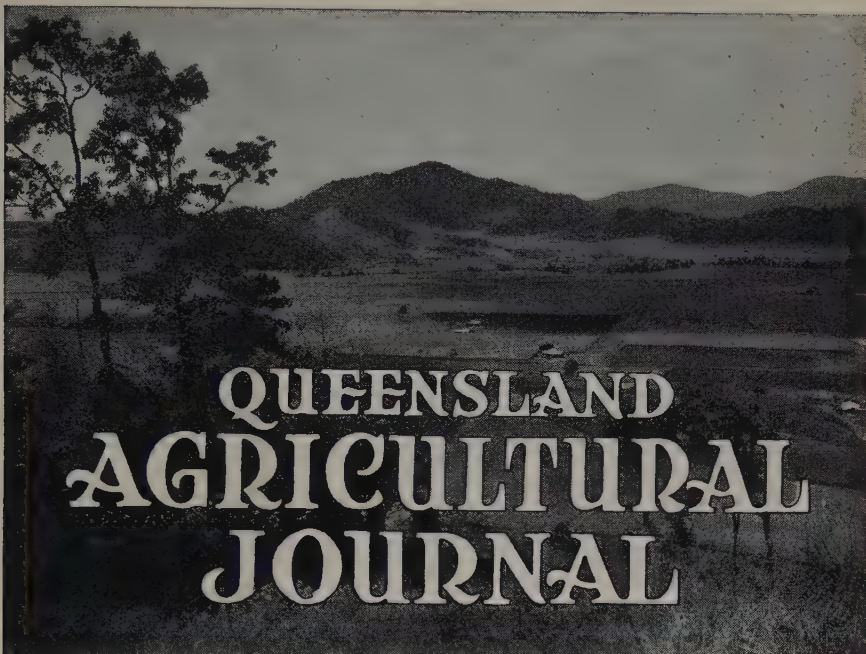
Apogee, 15th June, at 4.0 a.m
Perigee, 28th June, at 11.0 a.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.

ANNUAL RATES OF SUBSCRIPTION.—Farmers, Graziers, Horticulturists, and Schools of Arts, **One Shilling,** members of Agricultural Societies, **Five Shillings,** including postage. General Public, **Ten Shillings,** including postage.



Vol. XLIX. 1 JUNE, 1938. Part 6

Event and Comment

The March of Progress in North Queensland.

IN the course of a recent extensive tour of the Far North, his Excellency the Governor, Sir Leslie Wilson, was deeply impressed with the potentialities of the country north of Townsville, the enterprise of its people and the advance it has made in rural development.

Factors to which he drew attention in a Press interview on his return to Brisbane were the advantages of a road development policy, water conservation for electric power and irrigation, and the timber and tobacco industries.

On the Atherton Tablelands, he said, the most striking development was road construction. He was able for the first time to motor from Cairns to Innisfail, and on to Yungaburra, where he made his headquarters.

"The policy of the Government in regard to road development is a very good one," he stated. "It not only opens land for settlement, but it is giving haulier access to new country, enabling timber to be brought in to the mills in far larger quantities than ever before, and the settlers are provided with main roads by which they can get their necessary supplies.

"Any expenditure on these roads will be amply refunded by the access given to valuable timber, and there is no doubt whatever that

now that the tractor can be used, very valuable timbers, which were practically impossible to deal with in the past, can now be brought to the various mills. At the same time we have to be careful in regard to reafforestation, because we have to look to the future as well as to the present.''

The people of Cooktown were very hopeful for a revival of that area, his Excellency added. That was due largely to the timber which was now being worked. Aviation activities had expanded, and they had a fine aerodrome. They were anxious for the completion of the road from Daintree to Cooktown, but difficult country had to be overcome and a survey was not yet completed. They wished for a start to be made from Cooktown, as it would open the way to good timber country, which was along the route that obviously had to be followed.

One thing that impressed the Governor more than anything else was the success of the hydro-electric scheme from the Barron Falls, which he had opened. Power had now been distributed to Cairns and to many places on the Tablelands, and great progress was being made in extending the centres of distribution. A commission was to investigate whether more water could be impounded to enlarge the scheme. If that was not found practicable, there were other places, such as the Tully Falls, where water could be impounded. The scheme was an example of what could be done in Queensland. It had an immense value in giving cheap power to farmers for all their activities as well as for domestic convenience. There were many other places in the State where water could be used for similar purposes and for irrigation to excellent advantage, more particularly for the growing of tobacco, cotton, and vegetables and for fodder to offset drought in dairying and agricultural districts.

His Excellency stated that North Queensland was much more appreciated now than in the past, and many southern visitors, who thought that he had exaggerated its attractions, later informed him that he had not overestimated the definite assets that North Queensland possessed.

After visiting Mount Garnet and inspecting tin mining operations there, his Excellency remarked that the work presaged great success for the tin mining industry of the State.

Animal Health—New School of Veterinary Science.

ONE of the more notable of recent events was the opening by the Minister for Agriculture and Stock, Hon. Frank W. Bulcock, of the new School of Veterinary Science, within the University of Queensland, at the Animal Health Station at Yeerongpilly. For stockowners, this is certainly an important advance, although there are still a few who are inclined to question the wisdom of establishing a veterinary school at the present time. That idea, however, falls to the ground when it is remembered—as pointed out by Mr. Bulcock in the course of a notable opening address—that Queensland industries lose, it is estimated, no less a sum than £10,000,000 every year, through disease, wrong feeding, and other causes. As 80 per cent. of Queensland's export wealth comprises primary products, it is plain that much of that enormous loss is sustained by graziers and dairy farmers.

''I wonder,'' said Mr. Bulcock, ''how often we bother to think what unscientific feeding costs stockowners every year! It is no exaggeration to say that the aggregate cost runs into millions of pounds, while the

pig industry alone loses tens of thousands annually through the same cause. It is worth thinking about obviously, and if by training our own veterinary surgeons and nutrition experts we can prevent only a tenth of those avoidable losses the Veterinary School will more than pay for itself in quick time.

"Modern transport has brought Queensland closer to other countries—our next door neighbours, so to speak—and there is real risk of new diseases of live stock being introduced. Animals *will* catch disease, and our own young Queenslanders trained in veterinary science in our own school will, surely, prove one of the best means of preventing the disastrous diseases prevalent among the stock of some other countries becoming a menace to our own flocks and herds.

"There is certainly a great and growing need for veterinary surgeons in Queensland, and the future of veterinary practice in this State will depend upon the number of graduates turned out by the Queensland School of Veterinary Science. Only trained men—and under Professor Seddon there will be no doubt about the soundness of that training—can safeguard animal health and the animal wealth of the State.

"Already nineteen students have been enrolled and they are young men—and women, too—who would be a credit to any profession. The new school is certain to have a great influence on the development of pastoral and general farming industries in Queensland in future years."

A New Book on Plant Pest and Disease Control.

PESTS and diseases are responsible for considerable damage to valuable crops in Queensland. There is therefore a definite need for some reference publication, written in terms intelligible to the farmer or fruitgrower, containing information necessary for the diagnosis of the cause of the damage and for its effective control. This need was recognised by the Department of Agriculture and Stock some years ago in publishing "Pests and Diseases of Queensland Fruits and Vegetables" by Messrs Veitch and Simmonds, a profusely illustrated work in the field of economic entomology and plant pathology, adapted to Queensland requirements. Recently, this publication has been superseded by Volume III.* of *The Queensland Agricultural and Pastoral Handbook.* The new publication breaks a great deal of fresh ground and covers the whole field of plant pest and disease problems of any moment to agriculturalists and fruitgrowers in the State, with the exception of the problems associated with sugar-cane. As the Department sponsoring the publication is responsible for most of the entomological and plant pathological advisory and research services in Queensland, the volume constitutes a summary of the latest available information and is noteworthy for the clarity of presentation of the subject-matter.

Altogether, the volume summarises the fund of knowledge possessed by an extensive staff of officers familiar with pest and disease problems and with the fruitgrowers' and farmers' difficulties in coping with them. It is therefore indispensable to anyone who aims at the maximum production from his property and the lessening of natural hazards in agricultural and fruitgrowing pursuits.

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* *The Queensland Agricultural and Pastoral Handbook,* Volume III; Price, 3s., post free; Department of Agriculture and Stock, Brisbane.

New Departmental Chief.

APPOINTMENT OF Mr. ROBERT WILSON.

MR. ROBERT WILSON, who has succeeded the late Mr. Ernest Graham in the offices of Under Secretary and Director of Marketing of the Department of Agriculture and Stock, is a native of Queensland, having been born on the Logan River, where his father was engaged in cotton and cane planting and sugar manufacture.

On leaving the Brisbane Grammar School, Mr. Wilson entered the Public Service as a junior on the staff of the Department of Agriculture, in every branch of which he has served in the course of a career of well-merited distinction. Among various appointments, he has held the secretaryships of the Australian Rust in Wheat Conference, the annual agricultural conferences held in different parts of Queensland from 1897 to 1903, the Board of Advice under the Diseases in Plants Act, the Meat and Dairy Board, and the Royal Commission on Central Sugar Mills (1910-11). While holding these and similar positions, he travelled extensively throughout the State on business relating to agricultural and pastoral development and administration.

In January, 1925, Mr. Wilson was appointed Assistant Under Secretary, assuming the administrative responsibility, under Ministerial direction and by delegation from the Under Secretary, of a great department with activities and influence covering rural industry throughout Queensland. He is a member of the Agricultural Bank Board, Deputy Chairman of the Rural Assistance (Farmers' Rehabilitation Scheme) Board, and a member of the Dairy Products Stabilisation Board; and also has been appointed Government representative on the Butter and Cheese Boards and other commodity boards operating under the Primary Producers' Organisation and Marketing Acts and related legislation. He has frequently accompanied the Minister, Hon. Frank W. Bulcock, to interstate Ministerial conferences and to meetings of the Australian Agricultural Council.

Mr. Wilson volunteered for active service with the Australian Imperial Force in the Great War and served with the 47th Battery, 12th Australian Field Artillery Brigade, on the Somme during the 1916-17 winter, through the autumn operations in the Ypres area in 1917 and the subsequent winter campaign, and during the stirring and memorable events on the Somme and the Lys in the last year of the war.

Mr. Wilson was well known in amateur sporting circles and was associated with rowing for many years. He rowed with the Commercial champion eight of 1909. At different times he has held the offices of secretary, captain, and president of the Commerical Rowing Club (Brisbane), and selector for the Queensland Rowing Association. He was equally interested in cycling and for long terms was treasurer of the Queensland Cyclists' Union and captain of the Brisbane Safety Bicycle Club, of which he won the championship in 1903 and 1904. Among other noteworthy achievements in amateur sport, he won the road team (cycle) premiership of Queensland, the Brisbane Grammar School Old Boys' cycle race twice, and was second in the 5-mile championship of Australasia in 1900.

For many years, Mr. Wilson has been a member of the Royal National Agricultural and Industrial Association, and is a vice-president of the State Service Branch of the Returned Sailors and Soldiers' Imperial League of Australia.

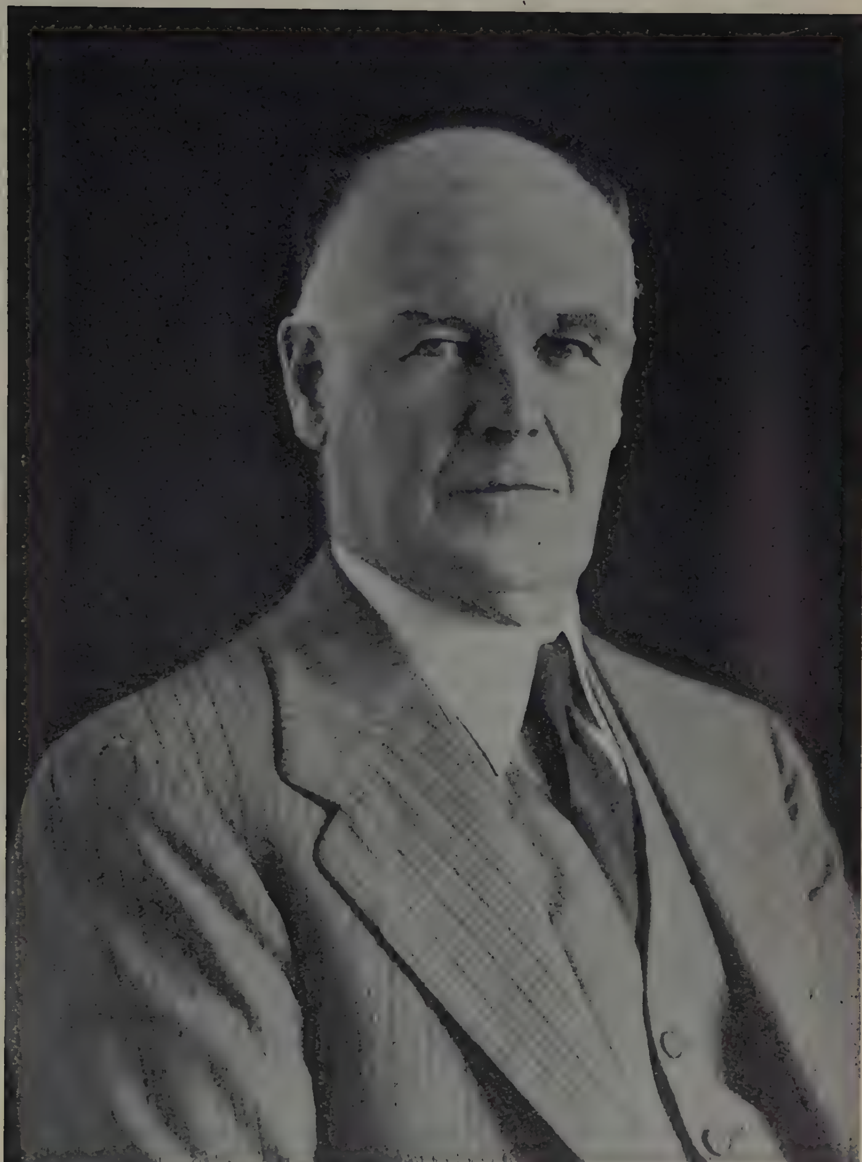

Plate 186A.

MR. ROBERT WILSON, Acting Under Secretary and Director of Marketing, Department of Agriculture and Stock.

The Soils of the Beerburrum-Glasshouse Mountains-Beerwah Area and their Suitability for Pineapple Culture.*

L. G. VALLANCE, B.Sc., Assistant Research Officer, and H. K. LEWCOCK, M.Sc., Senior Research Officer.

DURING the latter part of 1937 a soil survey was carried out in the Beerburrum-Glasshouse Mountains-Beerwah area for the purpose of determining—

(1) The various soil types occurring in these districts;

(2) The physical and chemical characteristics of the various soil types; and

(3) The relative suitability of these soil types for pineapple culture.

The data obtained from this survey has provided a basis, not only for effecting immediate improvements in fertilizing and cultural practices on pineapple soils in this area, but also for carrying out further research on these soils.

The survey has shown that the soils of the Beerburrum-Glasshouse Mountains-Beerwah area may be classified into four major types. These types, listed in the order of their potential agricultural value, have been designated as follows:—

(1) Glasshouse Sandy Loam.

(2) Glasshouse Sand.

(3) Beerburrum Fine Sand.

(4) Beerwah Sand.

In accordance with accepted practice, these names include a reference both to the distinguishing physical characteristic of the surface soil and to the district in which it is most commonly encountered. This does not mean, however, that the occurrence of any one of the types is necessarily limited to the district in which it was first recognised and from which it derives its name.

In the recognition of a particular soil type it is necessary to consider the surface, sub-surface, and subsoil layers as parts of one complete unit. The "surface" layer may be designated as that portion of the topmost soil which, because of its relatively high content of organic matter, is somewhat darker in colour than that underlying it. The depth of the surface soil varies considerably, and is not always easily discernible in dark or reddish coloured soils, such as the Glasshouse Sandy Loam. The "sub-surface" layer, as the name indicates, occurs directly below the surface layer proper, from which it is

* The first of a projected series of soil surveys covering the major pineapple-producing areas in southern Queensland was recently carried out in the Beerburrum-Glasshouse Mountains-Beerwah area, and forms the subject of a paper presented elsewhere in this issue. As this paper is necessarily somewhat technical in character, it has been considered desirable to present separately a short non-technical discussion of the data embodied in it, with particular reference to its bearing on pineapple production in the districts mentioned.

distinguished by a sharp drop in the amount of organic matter it contains, although it possesses essentially the same sand—clay ratio. The "subsoil" differs from the surface and sub-surface layers in that it is almost completely devoid of organic matter and usually contains a much higher proportion of clay. Throughout the Beerburrum-Glasshouse Mountains-Beerwah area the subsoil is generally red or yellowish-red in colour.

Although the roots of the pineapple plant rarely penetrate below the surface and sub-surface layers, the nature of the underlying subsoil exerts a marked influence on the rate and extent of root growth, since the movement and retention of soil moisture and, hence, the availability of mineral plant foods, is largely determined by the physical characteristics of the deeper soil layers. The following descriptions of the soil types which occur in the Beerburrum-Glasshouse Mountains-Beerwah area are based on data obtained from a large number of borings made to depths varying from 4 to 6 feet.

Glasshouse Sandy Loam.

This soil type is restricted to the higher levels and, consequently, it occurs under conditions of good surface drainage. The surface soil is quite reddish in colour and, while it contains about 40 per cent. of coarse sand, it has rather a loamy texture. Both the characteristic red colour and loamy texture extend to the subsoil. However, examination of a vertical face to a depth of about 3 feet shows that the high sand content of the surface layer does not persist at any great depth. At about 4 inches to 5 inches the soil becomes somewhat heavier. The subsoil commences at about 1 foot from the surface and is always coloured a very deep red. This colour, which is due to the iron content of the soil, is an indication of good drainage since, under conditions of poor drainage, iron is either taken into solution and removed, or converted into a less highly-coloured form.

In its virgin state the Glasshouse Sandy Loam supports a better vegetation cover than any other of the soil types in the Beerburrum-Glasshouse Mountains-Beerwah area. Tree growth is usually well developed and much of the timber is of marketable quality. In contrast to the poorly-drained sands occurring at lower levels, the flora of this soil rarely includes *Banksia* spp., while tea-tree is invariably absent. As might be expected from the type of vegetation which it carries, the Glasshouse Sandy Loam is better suited for agricultural purposes than any other class of soil in this area. Its suitability for pineapple culture has long been recognised, and several plantations at present growing on this class of soil are amongst the best in the State. (Plate 187.)

Glasshouse Sand.

On the lower portions of the ridge slopes the Glasshouse Sandy Loam generally gives way to a lighter type of soil, the Glasshouse Sand, from which it may be distinguished by an examination of the sub-surface and subsoil layers. As its name implies, the surface layer of the latter type of soil is much more sandy in texture and in colour it is not red but brown to greyish-brown. The sub-surface layer is lighter in colour than the surface soil, but still very sandy. In this type the deep red subsoil characteristic of the Glasshouse Sandy Loam does not come

Plate 187.

Four-year-old Smooth Cayenne pineapple field on virgin Glasshouse Sandy Loam, Glasshouse Mountains district.

closer than about 2 feet from the surface. On being brought under cultivation for the first time the surface soil of the Glasshouse Sand may be fairly dark-brown in colour, due to the presence of organic matter, since even a small amount of humus lends a definite colour to a light sandy soil. On examination, however, it will be found that the dark-coloured layer cuts out sharply at about 5 inches to 6 inches from the surface, going straight into the bleached-looking sub-surface soil.

The type and character of the vegetation on the Glasshouse Sand may vary considerably, but tree growth is usually only moderately good. Tea-tree and other swamp vegetation may occur at lower levels and, as the intrusion of such plants denotes poor natural drainage, the areas where they occur should be avoided for pineapples. Provided soils of the Glasshouse Sand type are well drained, however, they may be profitably employed for pineapple culture (Plate 188), although their extremely sandy nature causes them to dry out very quickly unless adequately shaded. This is particularly the case after they have been under cultivation for several years.

Beerburrum Fine Sand.

A characteristic feature of this soil type is the dry, powdery nature of its surface layer. As its name implies, this class of soil is encountered most frequently in the Beerburrum district. The surface and sub-surface layers are greyish-white in colour and very sandy, but, in contrast to the other three types under discussion, the sand content of this soil is made up of very fine particles. At a depth of about 1 foot a band of light-yellow subsoil is encountered, which becomes increasingly clayey in character at greater depths. Underlying the clayey subsoil is a tightly-packed layer of ironstone rubble and clay, which is usually from 2 to 3 feet in thickness. The depth at which this rubble occurs varies considerably, but it is generally encountered at about 2½ to 3 feet from the surface. It may, however, occur at the shallow depth of 18 inches and since the layer presents an almost impenetrable barrier to roots, care should be taken to note its depth from the surface before bringing soils of this type under cultivation.

Soils of the Beerburrum Fine Sand type carry only a poor stand of natural vegetation. Tree growth is usually stunted, while bracken is commonly the dominant feature of the undergrowth. In hollows or depressions, the occurrence of tea-tree thickets is typical, indicating the existence of swamp conditions. In fact, the poor natural drainage of this soil type is its most noteworthy characteristic, and one which limits its usefulness for agricultural purposes to areas where the surface contour and underlying formation is such as will permit of the quick removal of excess moisture. When soils of this type are employed for pineapple culture, especial attention should be given to drainage, since this crop is extremely intolerant of water-logged soil conditions.

Beerwah Sand.

This soil type is confined to low-lying areas and depressions and, consequently, it is frequently encountered under swamp conditions. The surface layer is almost pure sand and is grey-brown in colour. At a foot or less from the surface, however, the colour changes to yellow

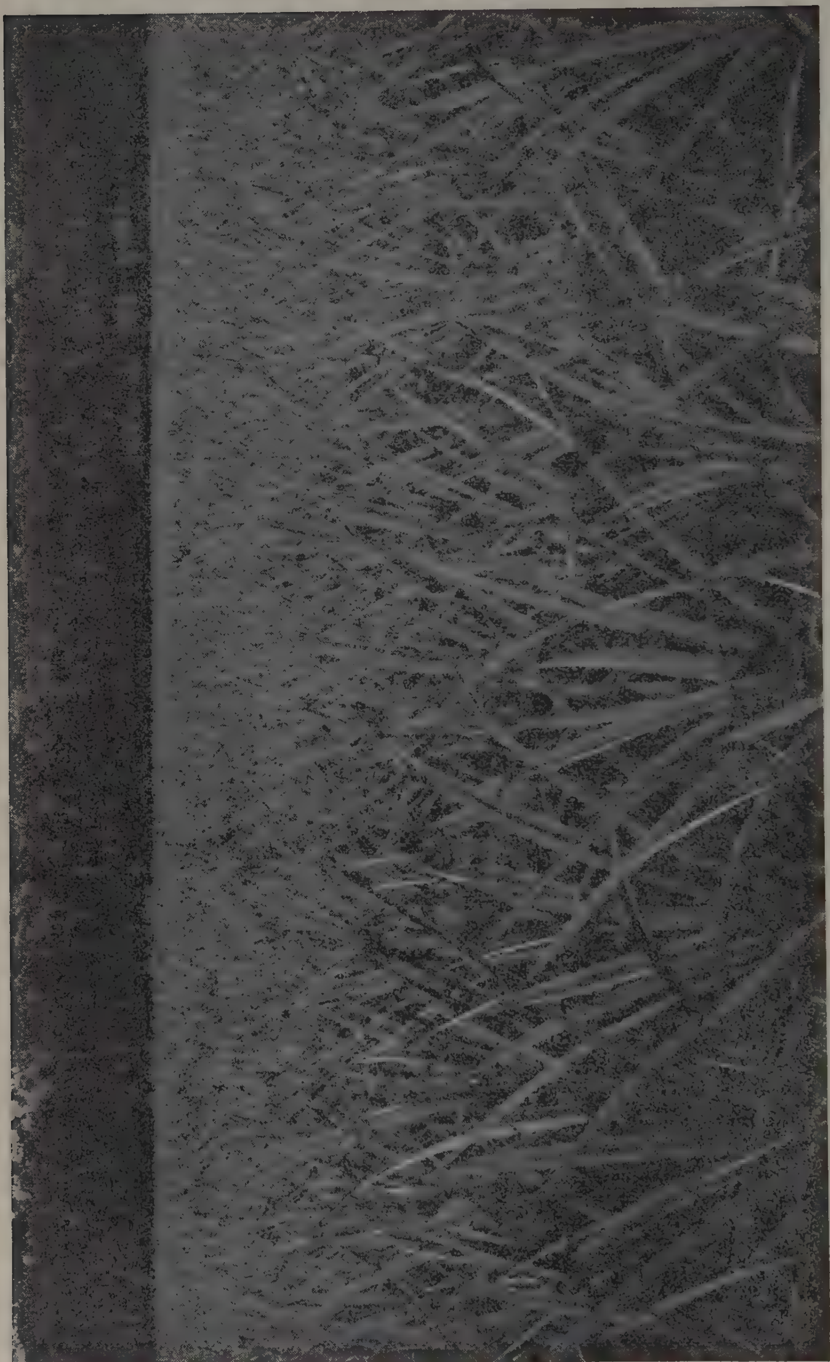

Plate 188.

Twelve-months' old Smooth Cayenne pineapples on virgin Glasshouse Sand, Beerwah district.

and this persists for a great depth, as does also the highly sandy nature of the soil. Analyses show that it may contain 80 per cent. of sand at a depth of 3 feet. On this type of soil, tree growth, if it occurs at all, is characteristically stunted; tea-tree and *Banksia* (honeysuckle) dominate the vegetation on the swampy areas. In every respect, this soil type is the poorest of those occurring in the Beerburrum-Glasshouse Mountains-Beerwah area. It appears to have little or no agricultural value and it is quite unsuited for pineapple culture.

Drainage.

In general, soils of the Beerburrum-Glasshouse Mountains-Beerwah district possess adequate natural drainage if they occur on the crown or upper slopes of one of the low ridges which are typical of this area. The type which is most frequently encountered under these conditions is the Glasshouse Sandy Loam. As previously mentioned, the deep red colour of the subsoil of this type is in itself an indication of good drainage, since under conditions of poor drainage the iron salts which give rise to this red colour are taken into solution and removed. In a few isolated localities, however, a clay-loam layer of low permeability intrudes in this type of soil at about a foot from the surface, and the interference with drainage caused by this layer may result in considerable erosion of the sandy, porous top soil during heavy storms. Where this relatively impermeable layer occurs, and also on slopes of more than usually steep gradient, particular attention should be given to the lay-out of the plantation when the land is planted to pineapples, and open surface drains should be provided in order to ensure a run-off of storm waters with the minimum loss of soil. The Glasshouse Sand, like the more loamy type just referred to, is also usually well drained except towards the bottom of a slope where it may become temporarily waterlogged during wet weather. Under such conditions, pineapple wilt is likely to develop unless adequate provision has been made for draining off surplus water. On ridges and sloping ground the drainage of the Beerburrum Fine Sand type of soil is generally satisfactory, but it should be remembered that the concretionary ironstone layer which underlies the subsoil is relatively impervious to water. Consequently, on this type of soil it is always advisable to lay out the rows in the direction of the slope in order that storm waters may be drained off as quickly as possible. The Beerwah Sand, because of its association with low-lying, swampy country and its fluctuating water-table, is nearly always unsuitable for pineapple culture. Owing to its low natural fertility, the artificial drainage of this type of soil is scarcely likely to prove profitable under existing economic conditions.

Moisture Relationships and the Need for Conserving Organic Matter.

Although the average rainfall of the Beerburrum-Glasshouse Mountains-Beerwah area amounts to between 50 and 65 inches annually, dry spells of fairly lengthy duration are not uncommon, particularly during the winter and spring months. Consequently, crop growth in the soils of this area is limited by their capacity to retain moisture during droughty periods. Unfortunately, the organic matter content of these soils—which is the factor chiefly determining the capacity of a sandy soil to retain moisture—is extremely low. Owing to the

appreciably higher content of both organic matter and fine soil particles in the Glasshouse Sandy Loam, this soil type sustains crop growth better during droughty periods than the more sandy types, because it does not dry out so quickly or to the same extent. In any of the soils, however, root growth is seriously retarded during prolonged dry periods unless steps have been taken to improve its water-holding capacity and to protect its moisture content from evaporation. Improving the water-holding capacity of a sandy soil is usually difficult in practice, as it can be effected only by increasing its content of organic matter. Cover-cropping during the inter-cycle period confers a temporary benefit only, since the dry weight of the organic matter returned to the soil in this way rarely exceeds 1 per cent. of the weight of the topmost foot of soil, and most of this disappears rapidly through decomposition while the land is being prepared for planting. Turning under the old pineapple plants is a far more valuable practice than intermittent cover cropping, since a well-grown crop should yield upwards of 20 tons of dry matter per acre at the end of a four-year cycle, and this contains a much higher percentage of fibrous residue than is usually obtained from the succulent, quick-growing annuals commonly employed as cover crops. Ploughing under old pineapple plants presents practical difficulties, but where these can be satisfactorily overcome the practice is a most beneficial one, particularly in soils with such a low organic matter content and, consequently, such a low water-holding capacity as those now under consideration.

Whether or not is is practicable to increase the water-holding capacity of these soils, however, every effort should be made to reduce evaporation of moisture from the surface layers. Shading the soil is effective in this connection. A simple and highly efficient means of accomplishing this is to space the plants more closely than is normally the practice in Queensland. The drier the locality or the lower the water-holding capacity of the soil, the closer should the plants be spaced, provided that the minimum spacing is not less than 5 feet 6 inches from centre to centre of the double rows nor less than 1 foot between the plants in the rows. Shading of the soil also tends to conserve the organic matter contained in it by slowing down decomposition processes. This is strikingly exemplified in the difference in productivity which usually exists between cleared virgin land and that which has been under cultivation for several years; in the districts under consideration, this difference is almost wholly due to the superior water-holding capacity of virgin soil which, prior to being brought under cultivation, is protected by a cover of natural vegetation.

The use of paper mulch provides a most effective means of conserving surface soil moisture in pineapple plantations, particularly in the early stages of growth before the foliage has grown sufficiently to provide adequate shade. Even soils of very poor water-holding capacity remain moist right to the surface throughout prolonged dry periods when protected by paper mulch. This has been demonstrated in various localities by field trials, particularly by one laid down on replant land at Beerburrum (Beerburrum Fine Sand) early in 1937. (Plate 189.) Prior to planting, the water-holding capacity of this soil was only 21 per cent. but, in spite of the fact that the seasons both preceding and following planting were amongst the driest on record, an excellent rate of growth has been maintained; so much so, in fact, that it

Plate 189.

A nine months' old replant field of Smooth Cayenne pineapples on Beerburrum Fine Sand, Beerburrum District. Rows on right planted in paper mulch; rows on left unmulched.

Plate 190.

An unmulched planting of nine months' old Smooth Cayenne pineapples on virgin Glasshouse Sand type of soil at Beerburrum: c.f. Plate 189.

compares favourably with the growth made by a nearby planting of the same age on unmulched virgin soil of the Glasshouse Sand type. (Plate 190.)

Where it is practicable to build up the organic matter content of the soil prior to replanting by shredding up the old pineapple plants, the tilth and water-holding capacity of the Glasshouse Sandy Loam type can be improved by deeper ploughing than is customary, since in this way the loamy sub-surface soil is brought to the surface. A ploughing depth of about 12 inches is recommended in such soils. In the case of the other soil types occurring in the Beerburrum-Glasshouse Mountains-Beerwah area, however, deep cultivation is not likely to improve their condition because of the extremely sandy or rubbly nature of the deeper layers.

Soil Reaction and Sulphur Requirements.

The soil reaction, as indicated by the pH value, exerts a marked influence on the vigour of growth of the pineapple plant since this plant is seldom able to obtain sufficient iron for its requirements in neutral or alkaline soils, and a stunted, narrow-leaved, chlorotic type of growth results. By maintaining the soil reaction between pH 4·5 and 5·0, an adequate supply of soluble iron is ensured unless the functioning of the roots is impaired by diseases or pests, or by unfavourable moisture or temperature conditions. In most soils, adjustment of the reaction to a pH value between the desired limits can be accomplished by an application of powdered sulphur prior to planting. The quantity of sulphur required to effect and maintain this adjustment on any given soil varies with (*a*) its initial reaction, (*b*) its physical and chemical properties, and (*c*) the extent to which it is proposed to use sulphate of ammonia for fertilizing the crop.

Under virgin conditions the reaction or pH value of the soils of the Beerburrum-Glasshouse Mountains-Beerwah area shows a remarkable degree of uniformity. Irrespective of their type, most soils of this area possess a pH value of between 5·5 and 6·0. In such a closely related group of soils variations in the amount of sulphur required to effect a given change in the pH value will be determined very largely by considerations of soil texture. In general, soils possessing the characteristics of the Glasshouse Sandy Loam will require heavier applications of sulphur than the lighter types. The accompanying table indicates the approximate quantities of sulphur required to adjust each of the soil types under consideration from varying initial pH values to a reaction favourable for pineapple growth. Since soils of the Beerwah Sand type are considered to be unsuitable for pineapple culture, no data on their sulphur requirement has been tabulated.

TABLE I.

pH.	6·5—6·1.	6·0—5·6.	5·5—5·3.
	lb. per acre.	lb. per acre.	lb. per acre.
Glasshouse Sandy Loam	500	450	250
Glasshouse Sand	400	350	200
Beerburrum Fine Sand	400	350	200

The acidifying effect of sulphate of ammonia on a soil is theoretically, about one-fifth of that of powdered sulphur. Consequently, the repeated application of sulphate of ammonia to the growing crop in the form of fertilizer may lead ultimately to the development of excessively acid conditions in the soil. At present no data is available on this point for the soils of the surveyed area. Should such conditions develop, however, they may be easily counteracted by the application of light dressings of lime at the end of each crop cycle, but liming of pineapple soils should not be carried out until technical advice has been obtained.

Chemical Characteristics and Fertilizer Requirements.

Chemical analyses show that the soils of the Beerburrum-Glasshouse Mountains-Beerwah area are all exceptionally deficient in mineral plant foods. Consequently, proper and adequate fertilizing of these soils is essential. For most crops, it is necessary to use a "complete" fertilizer mixture—i.e., one containing nitrogen, phosphoric acid, and potash—and for pineapples it is desirable that this mixture should be wholly compounded of water-soluble ingredients—except, possibly, in the case of the fertilizer placed under paper mulch—in order that the deficiency in these elements may be remedied immediately the fertilizer is applied. This is of particular importance in the case of the pineapple, since the vigour of the plant in the early stages of growth determines its productivity throughout the entire crop cycle. Because of the sandy nature and open texture of the soils, it is also preferable to apply the fertilizer mixture in moderate amounts at frequent intervals.

Owing to the extremely low nitrogen content of the Beerburrum-Glasshouse Mountains-Beerwah soils, crops grown on them will generally show an immediate and spectacular response to a dressing of sulphate of ammonia. Since a similar growth response is not usually evident from potassic or phosphatic fertilizers applied singly or in combination, the belief has gained ground that nitrogen is the only element lacking in these soils. Such a belief is entirely erroneous. While the supply of nitrogen is often the limiting nutritional factor for vegetative or leaf growth, the general vitality of a plant is dependent to a very large degree on the availability of other essential plant foods. Under conditions of potash or phosphoric acid deficiency, yields are diminished and the likelihood of losses from disease greatly increased. All of the soils of the Beerburrum-Glasshouse Mountains-Beerwah area exhibit a very marked deficiency in both of these elements, in addition to a shortage of nitrogen. The highest content of readily available phosphate which has been found in any virgin soil from this area to a depth of one foot is equivalent to a dressing of only 60 lb. of superphosphate per acre—i.e., the amount which is contained in one and one-quarter bags of "10-6-10" fertilizer mixture. The content of available (replaceable) potash is also generally much below the quantity required to obtain maximum yields from pineapples, namely, 500 lb. per acre foot. It is evident, therefore, that the profitable exploitation of these soils for pineapple growing entails the frequent application of fertilizers containing not only nitrogen, but phosphoric acid and potash as well.

For pineapples grown on these soils it is recommended that every thousand plants should receive annually at least 100 lb. of sulphate of

Plate 191.

A four months' old replant field of Smooth Cayenne pineapples on Glasshouse Sandy Loam type of soil. Note the vigour of growth which is obtainable on old land by systematic fertilizing combined with the use of paper mulch and close spacing of the plants.

ammonia, 30 lb. of superphosphate, and 20 lb. of sulphate of potash. This quantity of fertilizer should be applied in not less than four dressings, as follows:—50 lb. of "10-6-10" mixture in the spring and autumn and 25 lb. of sulphate of ammonia in midsummer and mid-winter. Even better response may be expected from somewhat lighter applications made at more frequent intervals. Base-leaf placement of the fertilizer will effectively increase its availability during dry periods and minimise losses due to leaching: this is the only satisfactory method of fertilizing pineapples which have been planted through paper mulch. Conservation of surface soil moisture is an important factor with regard to the intake of mineral plant foods by shallow rooting plants such as the pineapple; consequently, maximum results from fertilizing cannot be obtained from these soils unless provision has been made for shading the soil, either by close planting or, preferably, by close planting combined with the use of paper mulch (Plate 191). Where paper mulch is used, a portion of the total amount of fertilizer which is to be supplied to the crop during the cycle should be applied to the soil prior to laying the mulch; a dressing of "10-6-10" at the rate of 10 lb. per 100 feet of mulch is recommended.

Summary.

From an agricultural standpoint, the two most significant features of the soils occurring in the Beerburrum-Glasshouse Mountains-Beerwah area are (1) their low capacity for retaining moisture, and (2) their extreme deficiency in mineral plant foods. Consequently, the profitable exploitation of these lands for pineapple culture depends above all else on (1) the application of measures for conserving soil moisture, and (2) proper and adequate fertilizing of the crop throughout its growth.

Of the four soil types recognised in this area, the one which has been designated the Glasshouse Sandy Loam is markedly superior to the others in both its physical and chemical properties. However, the deficiencies noted above occur even in this soil type, although to a lesser degree than in the lighter types. In the descending order of their agricultural value, these other types are the Glasshouse Sand, the Beerburrum Fine Sand, and the Beerwah Sand. Because of its almost constant association with swampy conditions, the lastnamed is regarded as being entirely unsuitable for pineapple culture.

The Glasshouse Sandy Loam is nearly always characterised by good natural drainage since it occurs almost solely on ridges or slopes. The Glasshouse sand is well-drained where it occurs on slopes, but at low levels it is subject to water-logging. The drainage of the Beerburrum Fine Sand is also usually satisfactory on high ground, but because of the impervious nature of its deeper layers, the layout of the plantation should permit of the rapid "run-off" of storm waters.

Each of the four soil types has a low capacity for retaining moisture, due, in large measure, to the extremely small percentages of organic matter which they contain. Replenishing the organic matter content of these soils at the end of each pineapple cycle by turning under the old crop residues is recommended and also the application of cultural practices designed to minimise surface evaporation. In this connection trials now in progress indicate that profitable yields from replant land

will probably be obtainable only through the use of paper mulch. On the lighter soil types mulching is also recommended on virgin land.

Prior to planting any of the soils of the Beerburrum-Glasshouse Mountains-Beerwah area with pineapples, some adjustment of the soil reaction is generally necessary. In all cases, this can be accomplished by an application of powdered sulphur. The quantity of sulphur required to effect the desired change in reaction varies somewhat according to the type of soil, its pH value prior to treatment, and the type of nitrogenous fertilizer which it is proposed to apply to the crop. The rates of sulphur application recommended for each of the soil types at varying initial reaction values have been tabulated for easy reference.

The extreme deficiency in mineral plant foods of all of the soils under consideration indicates the need for adequate fertilizing. Because of this deficiency and the porous nature of the surface layers, the frequent application of light dressings of water-soluble chemical mixtures is considered preferable to heavy applications of slow-acting, organic base mixtures supplied only at half-yearly or yearly intervals. The use of the latter is not advocated except, possibly, where some portion of the fertilizer is applied under paper mulch prior to planting. Specific recommendations are made with respect to fertilizing pineapples grown on soils of the Beerburrum-Glasshouse Mountains-Beerwah area.

QUEENSLAND SHOW DATES.

June.

Maryborough	31st May to 2nd June
Biloela	2nd to 4th
Lowood	3rd and 4th
Childers	6th and 7th
Boonah	8th and 9th
Bundaberg	9th to 11th
Wowan—	
Show	9th and 10th
Rodeo	11th
Gin Gin	13th and 14th
Gladstone	16th and 17th
Marburg	17th and 18th
Rockhampton	21st to 25th
Mackay	27th to 30th
Kilcoy	30th June and 1st July

July.

Kilcoy	30th June and 1st July
Proserpine	1st and 2nd
Nambour	7th to 9th
Cleveland	8th and 9th
Ayr	8th and 9th

July—continued.

Townsville	11th to 14th
Rosewood	15th and 16th
Esk	15th and 16th
Charters Towers—	
Show and Rodeo	19th to 21st
Laidley	20th and 21st
Maleny	21st and 22nd
Cairns	26th to 28th
Gatton	28th and 29th
Caboolture	29th and 30th

August.

Atherton	2nd and 3rd
Pine Rivers	5th and 6th
Home Hill	5th and 6th
Royal National, Brisbane	15th to 20th

September.

Imbil	2nd and 3rd
Ingham	2nd and 3rd
Pomona	9th and 10th
Tully	9th and 10th
Beenleigh	16th and 17th
Southport	24th

A Soil Survey of the Beerburrum, Glasshouse Mountains and Beerwah Pineapple Districts.*

L. G. VALLANCE, B.Sc., Assistant Research Officer.

1. GENERAL DESCRIPTION OF THE AREA.

Location and Area.

THE area under review consists of approximately 3,500 acres in the parish of Beerwah, county of Canning. The North Coast Railway line, which runs more or less parallel to the coastline and about eight miles distant from it, passes through the townships of Beerburrum, Glasshouse Mountains and Beerwah, about which centres the productive areas are disposed. Beerwah Mountain, Lat. 26° 53′ 55″ S., Long. 152° 53′ 12 ″ 37 E., forms a convenient reference point, being some five miles east by one-half mile south of Glasshouse Mountains railway station.

Physiography.

The southern portion of the area is characterised topographically by the presence of flat low-lying country with tea-tree swamps typically developed. North of Beerburrum low undulating ridges make their appearance, the highest of which would not be more than 200 feet above sea-level. The heights of Beerburrum, Glasshouse Mountains and Beerwah townships are respectively 135, 87 and 103 feet above sea-level. Between these slightly elevated portions occurs a great deal of swampy country which has not been utilised for agricultural purposes. The cultivated areas are mostly confined solely to the ridges, which are usually flat-topped with gentle slopes. The area, therefore, may be referred physiographically to four major features—(*a*) the low flat tea-tree areas south of Beerburrum, (*b*) the plateau-like areas of limited elevation, (*c*) the gentle ridge slopes of these and (*d*) the interspersed tea-tree swamps. These are important, since they practically define the soil types under consideration.

The Glasshouse Mountains, which are briefly described later, form the western boundary. The effect of these igneous peaks on the soil formation of the area is unimportant, and the numerous intrusions associated with them have little significance from a soil point of view in the area surveyed.

Geology.

The country rock consists of Mesozoic sandstones with interbedded shales. The sandstones are ferruginous and coarse-grained, and, in many cases, grade into grits. Fairly large water-worn pebbles sometimes occur, scattered sparsely throughout the soil profile in the lower horizons. The coarseness of the parent material is often reflected in the texture of the Glasshouse Sandy Loam, and in one locality (Portion 92v, 3, 4) the concentration of the fine gravel and coarse sand fraction is most marked. A feature of these sediments is their non-calcareous nature. They belong to the Ipswich Coal Measures, which are regarded as Triassic.

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* A non-technical discussion of the data embodied in this paper in its relation to pineapple production in the surveyed area is presented elswhere in this issue, viz., "The soils of the Beerburrum-Glasshouse Mountains-Beerwah area and their suitability for Pineapple Culture."

The area is flanked on the west by a series of isolated sub-acid lava flows and plugs forming the Glasshouse Mountains which rise to a maximum elevation of 1,814 feet at Mount Beerwah. The outcrops are chiefly trachyte; there is little indication of any pyroclastic material, and flow structure is often in evidence. A characteristic feature is the presence of sanidine felspar and numerous small crystals of ægerine, giving the rock a definite speckled appearance. Comendites, pantellarites, dacite and rhyolite also occur. A full description of these igneous rocks is given by Richards.[1]

Natural Vegetation.

The prevailing vegetation is eucalyptus forest. From general observation there is little correlation between the various species and soil type. It would appear that in these closely related soils the actual growth status of the vegetation is the distinguishing feature, tall timber and good growth being more characteristic of the Glasshouse Sandy Loam and Glasshouse Sand.

The common bracken (*Pteris aquilina*), banksias, and the paper-bark (*Melaleuca leucadendron*) are typical of the Beerwah Sand and Beerburrum Fine Sand. The grass tree (*Xanthorrhea* sp.) is common to all types, while the Tallowwood (*Eucalyptus microcorys*) is noticeably associated with the Glasshouse Sandy Loam. A representative list of the eucalypts and other macrovegetation of the area is as follows:—Tallowwood (*E. microcorys*), Yellow Stringybark (*E. acmenioides*), Red Stringybark or Messmate (*E. resinifera*), Grey Gum (*E. propinqua*), Blackbutt (*E. pilularis*), Red Bloodwood (*E. corymbosa*), White Bloodwood (*E. trachyphloia*), Spotted Gum (*E. maculata*), Scribbly Gum (*E. micrantha*), Turpentine (*Syncarpia laurifolia*), Paperbark (*Melaleuca leucadendron*), grasstree, banksia, and bracken.

2. DESCRIPTION AND CLASSIFICATION OF SOIL TYPES.

A feature of the soils of the area, with the possible exception of the Glasshouse Sandy Loam, is the highly leached condition and very sandy nature of the surface horizons. There are no very marked climatic or geologic variations and the soils must be regarded as belonging to one series. Four major types have been recognised and have been named according to the usual nomenclature, the name signifying the location of the major occurrence and also the texture of the surface horizon.

(*a*) Glasshouse Sandy Loam.

(*b*) Glasshouse Sand.

(*c*) Beerwah Sand.

(*d*) Beerburrum Fine Sand.

Since the object of this survey was to provide a basis for agricultural investigational work, certain minor differences in the poorly productive types—e.g., the Beerburrum Fine Sand—have been disregarded. No useful purpose, under present conditions, could be served by attempting to define these variations. From the point of view of pineapple culture the inferiority of this type is obvious. Equally well defined is the relative superiority and drought-resisting capacity of the Glasshouse Sandy Loam. The surface soils of both types, as shown in Part 3, are very low in plant foods. The organic carbon and nitrogen content is also deficient. The significant difference is in the texture,

not only of the surface horizon, but also of the sub-surface. On profile investigation, it is immediately seen that the Glasshouse Sandy Loam possesses a structure retentive of moisture, yet in no way hindering natural drainage. The importance of this fact, having due regard to the climatic characteristics of well-marked wet and dry periods prevailing within the area, cannot be too strongly stressed.

Maps showing the general distribution of each soil type are included in this paper. It is not intended that the boundaries which have been defined should be regarded as the absolute lines of demarcation between the types. There is no abrupt transition in the field and the sequence, Glasshouse Sandy Loam—Glasshouse Sand—Beerwah Sand is the normal one in passing from the higher to the lower levels of the gentle slopes.

(a) Glasshouse Sandy Loam.

This is without doubt the most fertile of all four of the soil types described. It occupies the higher levels, and the major outcrops lie to the west of that portion of the North Coast railway between the stations of Glasshouse Mountains and Beerwah. It is readily recognised by its profile development, which is fairly uniform throughout, and by its colour. A typical profile is illustrated diagrammatically in Plate 193.

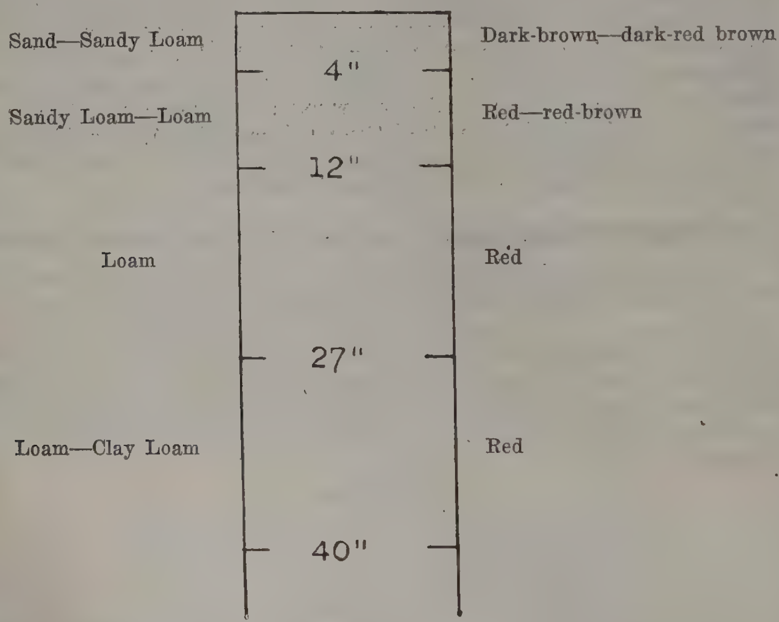

Plate 193.
Profile of Glasshouse Sandy Loam.

A gradual increase in texture and colour with depth is characteristic, there being no abrupt change from one horizon to the other. The surface horizon is perhaps the most clearly defined. In general, this is about 4 inches deep and may vary from dark brown to dark red-brown in colour and sandy to sandy loam in texture. The clay percentage varies from 10 per cent. to 20 per cent. , whilst the coarse sand averages 40 per cent., predominating by about 5 per cent. over the fine sand.

The fact that this coarse sand may be very coarse indeed, approximating to fine gravel, often gives the soil a rather deceptive excessively sandy "feel." This occurs in some localities and appears to be due to variation in grain size of the parent grits. In such cases the coarse texture has allowed a marked mechanical eluviation, and there is a tendency for a compact sandy clay horizon of low permeability to develop about a foot below the surface. Consequently, there is a danger of considerable erosion and wash on such soils during heavy rainfall. This is particularly noticeable on the south-western portion of Portion 90v. The occurrence of these coarse-grained types is patchy and would entail a considerable amount of work to define. It is limited in extent and is not a serious fault providing a little care is exercised by the grower in the layout of the crop rows.

The sub-surface in the type profile is about 8 inches in thickness, and this is fairly general throughout the area. Its texture varies from sandy loam to loam, and its colour from red to red-brown. If this A_2 horizon is turned up during cultivation the sandy texture of the surface soil will be favourably modified, thereby increasing its water-holding capacity. When this soil type is well cultivated a good tilth is obtained which differs markedly from the single-grain nature of the other types.

The subsoil, which occurs at a depth of 12 inches in the type sample, is a deep red loam which is retentive of moisture yet has no tendency towards waterlogging. It will be seen, therefore, that physically this soil may be regarded as good; its ability to continually supply the soil moisture required for root development is a factor which allows a more effective response to quick-acting fertilizers.

TABLE 1.

MECHANICAL ANALYSES AND CHEMICAL DATA OF GLASSHOUSE SANDY LOAM PROFILE.

Sample No.	4464	4465	4466	4467
Depth in inches.	0–4	4–12	12–27	27–48
	%	%	%	%
Coarse Sand	42·40	36·50	33·52	21·52
Fine Sand	34·80	34·25	30·80	21·88
Silt	9·75	7·20	7·00	5·38
Clay	10·12	18·60	26·40	42·02
Loss on Acid	1·20	1·27	..	..
Moisture	2·3	2·25	2·58	7·80
R_2O_3	5·94	9·64	15·11	23·04
Fe_2O_3	2·18	3·62	5·10	8·25
P_2O_5	·03	·01	·02	·02
CaO	·06	·03	·05	·04
MgO	·010	·016	·017	·014
K_2O	·042	·040	·034	·042
Organic C.	1·72	·76	·33	·25
Reaction	6·13	5·6	5·7	5·5

Reference to Table 1 shows that the clay content increases appreciably in the subsoil horizon—i.e., 12 to 48 inches. In the lower portion, the figure of 42 per cent. would imply a heavier nature than is apparent in the field. The same table, however, shows that this horizon is markedly sesquioxidic in character, which factor no doubt contributes

to the permeability and good drainage of the subsoil. The translocation of the Fe and Al within the profile is an indication that this soil has been affected by a process of weak podsolisation. However, the relatively high concentration of sesquioxides still within 12 inches of the surface, and the absence of any bleached A_2 horizon implies that this soil is not so extensively podsolised as the types which are discussed later.

There is no accumulation of organic matter in the lower horizons, and there is a decrease in pH with depth.

The lime content is extremely low throughout and, since the distribution of this element is influenced by plant growth, there is evidence of some accumulation at the surface from the deposition of plant residues. The A_2 horizon is the most impoverished in Ca.

Ferruginous concretionary material occurs frequently within the profile, being met with at depths varying from 3 to 7 feet. It is impossible to penetrate this layer with a 4-inch soil augur. The nature and distribution of this material is further discussed on pages 575-577.

(b) Glasshouse Sand.

In close association with the Glasshouse Sandy Loam and topographically related to it, is a well-leached light-coloured sandy soil which has been called the Glasshouse Sand. This type occurs on the ridge slopes, particularly on the lower levels of the slopes occupied by the heavier type. The profile of a typical occurrence is given in Plate 195.

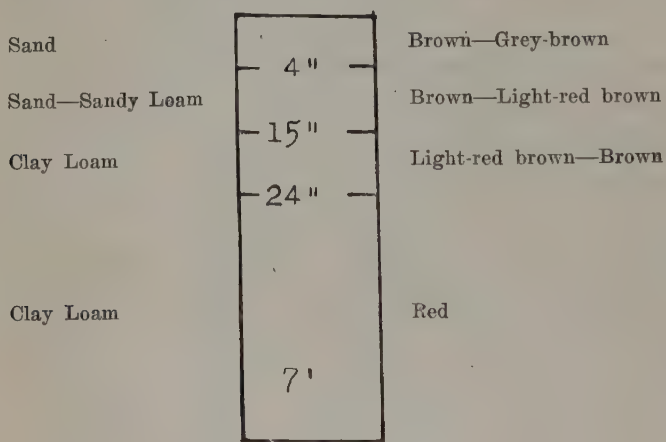

Plate 195.
Profile of Glasshouse Sand.

A feature of the profile is its leached appearance and the sandy texture of the A horizon. The surface is a brown to grey-brown sand containing about 1 per cent. organic carbon, largely undecomposed woody material. This drops off sharply to about 0·5 per cent. in the sub-surface at a depth of about 4 inches. The sub-surface as seen from Table 2 is also sandy and brown to light red-brown in colour. This continues to 15 inches in the type sample, but may be deeper as the bottom of the slope is approached.

Since the A horizon is 15 inches deep, it is the one to which the majority of the roots of the pineapple is confined. From its sandy nature and low organic matter content it is obvious that its field capacity for moisture is very poor, and this is reflected in the relatively poor growth of the natural vegetation cover. In the case of the surface-rooting pineapple, the conservation of the surface soil moisture is an important factor in its response to applied fertilizers; and careful attention must be given to this factor when soils of the Glasshouse Sand type are planted with this crop.

TABLE 2.

MECHANICAL ANALYSES AND CHEMICAL DATA OF GLASSHOUSE SAND PROFILE.

Sample No.	4492	4493	4494	4495
Depth in inches.	0–4	4–15	15–24	24–72
	%	%	%	%
Coarse Sand	41·7	38·8	29·3	22·1
Fine Sand	42·6	40·7	32·6	27·6
Silt	5·2	7·2	7·4	5·0
Clay	5·9	8·6	23·6	38·4
Loss on Acid	nd	nd	1·3	nil
Moisture	1·3	1·9	6·0	7·0
R_2O_3	2·63	4·31	12·22	16·12
Fe_2O_3	1·26	1·92	3·86	6·00
P_2O_5	·013	·021	·020	·018
CaO	·056	·028	·028	·035
MgO	·014	·036	·094	·051
K_2O	0·27	·023	·023	·042
Organic C.	1·0	·51	·52	·18
Reaction	6·0	5·8	6·0	5·8

A comparison of the Fe_2O_3 and R_2O_3 figures as shown in Table 2 with those of Table 1 bear out the more intense nature of the leaching processes which have acted upon this type. The low ferruginous content, even at depths of approximately 2 feet, is a major index in the recognition of this soil in the field. While the lower proportion of bases is not particularly significant in the profile analysis, the lower base status of the type is well borne out in the figures for replaceable base estimations given in Tables 8 and 9.

Concretionary rubble may occur in the profile throughout the area. Its occurrence within 7 feet of the surface is, however, rather infrequent, but may often be observed in cuttings at a greater depth than this. It was not encountered in the type profile.

There is a marked increase in the clay content from 8·6 per cent. at 4 inches to 15 inches to 23·6 per cent. at 15 inches to 2 feet. With its porous surface horizons and greater clay content in the subsoil there is a danger of periodic waterlogging in this type when the topography is disposed to such conditions. Where this has been observed in the field it is marked by a noticeable decline in the health of the pineapple plant and its resistance to wilt.

No accumulation of organic matter in the lower horizons was noted in the large number of field profile studies, and the figures of Table 2 are representative of the decrease in carbon with increasing depth. The pH of the profile remains fairly uniform.

(c) Beerwah Sand.

The Beerwah Sand, which occurs extensively throughout the area, is usually confined to the lower lying portions. It is closely associated with the swamp soils from which no attempt has been made to distinguish it. It is definitely "hungry" country supporting a very poor type of vegetation. A typical profile is illustrated in Plate 196.

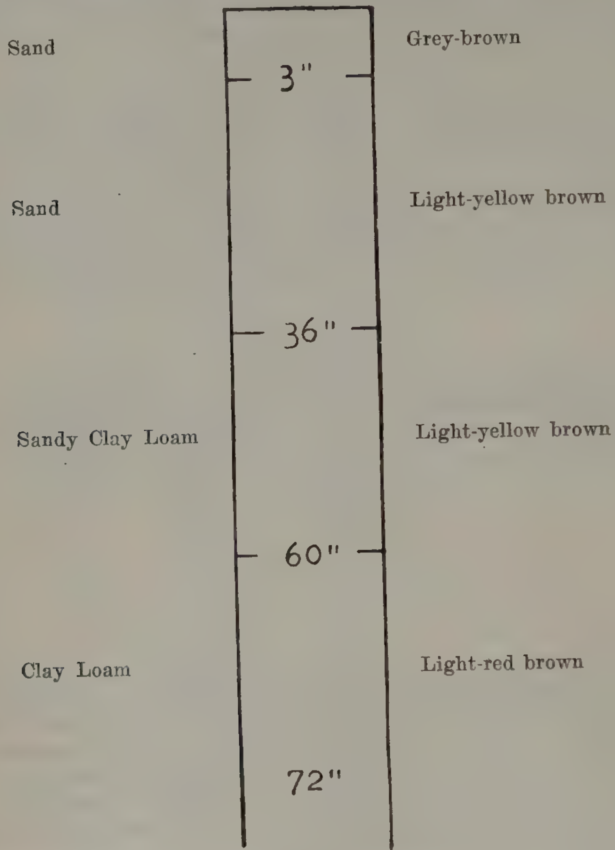

Plate 196.
Profile of Beerwah Sand.

The 3 inches of surface soil contain almost 90 per cent. sand, in which the coarse sand predominates by about 20 per cent., and this high content of sand continues down to 3 feet in the type sample. The depth of this extremely sandy horizon is one of the factors which renders this soil exceptionally poor from an agricultural point of view.

The subsoil is light yellow-brown in the B horizon and the texture is that of a sandy clay loam, the clay content being 22 per cent. and that of sand 66 per cent., the fine and coarse sands being present in approximately equal amounts. Below this the clay further increases to 33 per cent.

In the type areas this soil carries a typical swamp vegetation. In the wet season it may be dangerously waterlogged. The lower horizons are characterised by frequent red and yellow mottling, indicative of bad drainage.

The transition point from this soil to the type occupying the higher levels, usually the Glasshouse Sand, is never clearly defined. At the transition stage, the drainage of the Beerwah Sand may be quite good, and any cultivation of this soil should be limited to these areas.

TABLE 3.

MECHANICAL ANALYSES AND CHEMICAL DATA OF BEERWAH SAND PROFILE.

Sample No.	4511	4512	4513	4514
Depth in inches.	0–3	3–36	36–60	60–72
	%	%	%	%
Coarse Sand	54·2	44·2	33·7	31·8
Fine Sand	33·7	43·0	33·0	26·5
Silt	5·6	3·8	9·7	6·0
Clay	4·7	7·8	22·1	33·3
Loss on Acid	·5	·9	·8	·8
Moisture	1·4	·1	1·1	1·5
R_2O_3	..	3·24	12·98	15·76
F_2O_3	..	1·28	4·36	5·62
P_2O_5	..	·009	·024	·015
CaO	..	·035	·035	·028
MgO	..	·063	·051	·030
K_2O	..	·023	·036	·017
Organic C.	1·37	·33	·16	·20
Reaction	5·5	5·7	5·3	5·10

Owing to the many difficulties attendant upon the cultivation of this soil type and its unimportance from an economic standpoint, no good purpose could be served by a detailed study of its features. The tables of analytical data on pages 564-568 further shows its inferiority. The mechanical analyses and chemical data of the type profile are given in Table 3.

(d) Beerburrum Fine Sand.

This soil covers a large area of flat, featureless terrain, of which a large portion is occupied by swampy or badly-drained country, with tea-tree typically developed. Any cultivation is confined to the slight ridges and ridge slopes which begin to appear towards the northern boundary in the vicinity of the Beerburrum township. These low elevated areas are naturally well drained, and the present investigation was confined to them. The typical profile is shown in Plate 198.

The predominating characteristic of the surface horizon of this soil type is its thoroughly leached condition. The fineness of its sandy texture is also well marked. Although the mechanical analysis of the 0-6-inch horizon given in Table 4 shows equal amounts of coarse and fine sand, this coarse sand must be close to the lower limit of ·2 mm., and its fineness is marked in comparison with the coarse sands of the other types. It is noticeable that the relative proportion of the fine sand fraction increases below the surface.

A feature of the profile is the presence of rounded concretions. These occur over a large area of country, and have been observed *in situ* at a point some two miles south of Caboolture, and frequent occurrences are to be noted from there to the type area which is nine miles north of Caboolture. This concretionary horizon occurs at a depth of 2 feet

6 inches to 3 feet, and this depth is remarkably constant, though in a few places it has been noted to outcrop almost on the surface, usually on the ridge tops: for example, on Portion 427 the rubble begins to appear at 18 inches from the surface. The horizon is about 2 feet thick, and is so thickly studded with the concretions that it is impossible to pass through it with a soil augur or spade. The pellets are quite hard, but may be sectioned easily by a pair of stout scissors. Externally they present a yellowish-brown smooth appearance of about 2 or 3 cm.

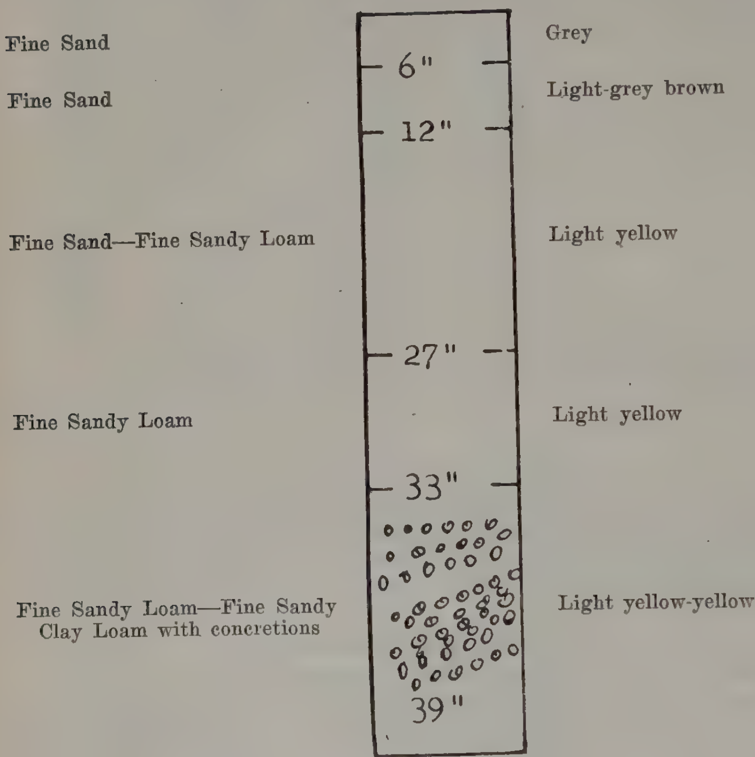

Plate 198.
Profile of Beerburrum Fine Sand.

diameter. When sectioned the compact outer portion is seen to be limited to a thickness of about 1 mm. or less. Internally they consist of fine sand grains cemented by red ferruginous material. Many of them, however, are quite black inside, and this second type is scattered through the topmost portion of the rubble horizon. This dark colour is probably due to manganiferous material, an analysis showing 15·6 per cent. of manganese calculated as Mn_3O_4, plus 15·6 per cent. Fe_2O_3. No P_2O_5 was found. The material in which the rubble is embedded has the texture of a yellow, fine sandy clay loam. In the true swamp areas there is no concretionary horizon, a grey clay with red and yellow mottling being encountered in its stead. The present investigation called for no detailed chemical examination of the rubble layer, but field observations show that the clay increases towards the bottom and the underlying material is, in general, a grey sandy clay to light clay

with red and yellow mottling, the clay becoming heavier with depth. This band of concretions presents an almost impenetrable barrier to root penetration.

TABLE 4. (*a*).

MECHANICAL ANALYSES OF BEERBURRUM FINE SAND PROFILE.

Sample No.	4429	4430	4432	4433
Depth in inches.	0–6	6–12	27–33	33–39
	%	%	%	%
Coarse Sand	46·54	35·92	31·54	30·12
Fine Sand	41·46	48·46	46·40	44·15
Silt	3·63	5·93	7·58	10·12
Clay	4·03	8·38	13·38	14·65
Loss on Acid	2·13	·52	·73	·42
Moisture	·67	·48	·47	·98
Organic C.	1·18	·55	·22	·22
Reaction	6·3	6·1	5·8	5·6

TABLE 4 (*b*).

CHEMICAL DATA OF SUB-SURFACE AND SUBSOIL HORIZON OF BEERBURRUM FINE SAND.

Soil No.	Depth Inches.	R_2O_3.	Fe_2O_3.	P_2O_5.	CaO.	MgO.	K_2O.
		%	%	%	%	%	%
4431 ..	12–27	2·02	·82	·014	·028	·060	·019
4433 ..	33–39	2·26	2·18	·013	·035	·060	·027

Mechanical analyses and chemical data of the Beerburrum Fine Sand are given in Tables 4 (a) and 4 (b). Further chemical data of surface soils are given on pages 564-568. Towards the northern edge of the Beerburrum Fine Sand, in Portions 500-505, a red phase begins to make its appearance, the surface soil of which is slightly browner in colour than the type proper but essentially the same in texture. The subsoil, however, which occurs at a depth varying from 1 to 2 feet, is a light red-brown to red loam, and is remarkably similar to the material underlying the Glasshouse Sandy Loam and Glasshouse Sand, but it was so sporadic in occurrence and so limited in extent as not to warrant detailed investigation.

The figures for the analytical data show the completeness of the leaching of the Beerburrum Fine Sand, and its negligible content of plant food material indicates the necessity for the application of a complete fertilizer.

In common with the Glasshouse Sand, an inherent defect of this type is its inability to withstand droughty periods, and the need for providing some practical means of materially increasing its moisture-holding capacity must be recognised.

3. LABORATORY INVESTIGATIONS.

Ninety samples of surface soils from the area were submitted to laboratory investigation. These were all selected from virgin areas, and each sample represents an average of three samplings. The depth

of sampling was to 9 inches, and this in most cases comprises the A_1 and the topmost portion of the A_2 horizon. This is the portion which is most significant from the point of view of analytical estimation of the nutrient requirement of the shallow-rooting pineapple plant.

All percentages refer to the air-dried material passing a 2 mm. sieve.

(a) Nitrogen, Organic Carbon, and C : N Ratio.

The figures for organic material are strikingly low on all of these soils. This is to be expected from the almost entire absence of surface litter. The eucalyptus forest conditions which prevail are not favourable to the accumulation of humus. Any surface material is predominantly of a woody nature, and the prevalence of bush fires during the hot, dry seasons accounts for the general dearth of nitrogen and the wide carbon-nitrogen ratios.

TABLE 5.

DISTRIBUTION TABLE OF THE % NITROGEN CONTENT OF SURFACE SOILS.

Type.	·021–·03	·031–·04	·041–·05	·051–·06	·061–·07	·071–·08	·081–·09	·1–·12
Glasshouse Sandy Loam ..	1	4	6	6	7	1	5	..
Glasshouse Sand	4	7	7	3	2	1	..	..
Beerwah Sand	1	..	10	..	..	..	1	..
Beerburrum Fine Sand ..	1	..	1	..	1	2	1	1
Total	7	11	24	9	10	4	7	1

Reference to Table 5 shows that the N content of the surface soils varies from the extremely low figure of ·02 per cent. to about ·1 per cent., and that the majority do not exced ·05 per cent., which is very deficient. It is not surprising, therefore, to note the very pronounced response to nitrogen fertilizers in the pineapple plantations throughout the area.

While there is a range within the types themselves, the distribution table shows that the nitrogen content of the Glasshouse Sandy Loam is appreciably higher than that of the Glasshouse and Beerwah Sands. The greatest variation is in the Beerburrum Fine Sand, the highest values being from samples taken from cleared land and now under secondary growth.

TABLE 6.

% ORGANIC CARBON. DISTRIBUTION TABLE FOR SURFACE SOILS.

Type.	·5–·75.	·75–1.0	1.0–1·25.	1·25–1·5.	1·5–1·75.	1.75–2·0
Glasshouse Sandy Loam	1	6	9	8	4	2
Glasshouse Sand ..	5	6	7	5	1	..
Beerwah Sand ..	5	4	5	..	..	..
Beerburrum Fine Sand	..	2	3	4	1	..
Total	11	18	24	17	6	2

With regard to organic carbon, the frequency distribution Table 6 shows that the range in all types is from ·5 per cent. to 2 per cent. Considering this in terms of organic matter (Organic C X 1·724), the range is ·8 per cent. to 3·74 per cent. organic matter with the greatest number of estimations falling between 1·72 per cent. and 2·2 per cent.

This must be regarded as low from an agricultural point of view. The Glasshouse Sandy Loam again appears to better advantage in comparison with the other types, the organic C being distributed about a somewhat higher mean.

The extremely wide C : N ratios in the distribution Table 7 is proof that much of the organic matter present consists of undecomposed fibrous woody material, and that "humified" matter occurs only in minor amounts. That this is the case is also evident from a field examination of most of the soils since, with the exception of the Glasshouse Sandy Loam, they are usually light-coloured and the presence of inert charcoal from periodic burns is often noticeable.

TABLE 7.

DISTRIBUTION TABLE OF C : N RATIOS OF SURFACE SOILS.

Type.	10–15.	15–20.	20–25.	25–30.	30–35.	35–40.	40–45.	45–50.
Glasshouse Sandy Loam ..	1	6	16	6	1	..	..	..
Glasshouse Sand	1	6	3	6	1	4	1	1
Beerwah Sand	1	4	2	2	..	1	..	..
Beerburrum Fine Sand ..	..	4	1	..	..	..	1	..
Total	3	20	22	14	2	5	2	1

The range 20-25 is indicative of the average carbon-nitrogen ratio for surface soils of the area under review.

(b) Replaceable Bases.

Since it has been shown[2] that the determination of the replaceable potassium of a soil is a reasonably reliable index of potash availability for pineapples, this determination was made on a number of surface soils from all types.

The frequency distribution in mille equivalents K per 100 gms. air-dried soil is given in Table 8.

TABLE 8.

DISTRIBUTION TABLE REPLACEABLE K (m.e. %) OF SURFACE SOILS.

Type.	·05.	·05–·10.	·11–·15.	·15–·20.	·20–·25.	·25–·30.	·3–·4.	·4–·5.
Glasshouse Sandy Loam ..	..	1	2	6	5	1	1	2
Glasshouse Sand	1	6	6	3	1	2	..	..
Beerwah Sand	..	4	4	1	..	..	..	..
Beerburrum Fine Sand ..	..	2	2	2	..	..	1	..
Total	1	13	14	12	6	3	2	2

It will be seen from the above table that there is a variation in replaceable potash from type to type and also within the types themselves, and that, in general, the values are all low. The Glasshouse Sandy Loam is definitely higher than the rest, the maximum number of estimations falling about the value ·2 m.e. The Beerwah Sand and the Beerburrum Fine Sand are very low indeed, one odd high value of the latter type refers to a sample from a flat running to tea-tree on Portion 441. Magistad[2] has shown that ·5 m.e. of replaceable potash per 100 gms. soil represents the limit beyond which no response to potash fertilizer is obtained in Hawaiian pineapple soils, and applying this figure tentatively to the soils of the area surveyed it is obvious that the present practice of supplying relatively heavy dressings of potash to pineapples grown in these soils is a sound one.

Table 9 shows that the figures for replaceable Ca, Mg, and K are low throughout. This is in keeping with the low clay content of the soils, and is further reflected in the acid nature of the reaction. Again, since the soil organic matter is an important factor in controlling the cationic exchange capacity, it is to be expected that these low humus soils would be very poor in base status.

TABLE 9.

REPLACEABLE K, Ca and Mg (m.e. %) OF SURFACE SOILS.

Glasshouse Sandy Loam.				Glasshouse Sand.			
No.	Ca.	Mg.	K.	No.	Ca.	Mg.	K.
4434 ..	1·5	1·26	·16	4469	1·75	1·97	·11
4435 ..	2·3	1·80	·51	4470	1·80	1·97	·18
4440 ..	2·0	1·62	·31	4472	1·1	1·49	·07
4442 ..	1·5	1·26	·17	4473	1·8	2·26	·10
4445 ..	1·1	3·32	·16	4479	1·1	1·62	·12
4447 ..	2·4	2·70	·16	4480	1·5	1·53	·13
4450 ..	1·1	1·62	·11	4483	2·4	·99	·28
4452 ..	1·7	2·01	·11	4485	1·2	1·80	·10
4455 ..	1·5	3·49	·17	..	..	..	..
4458 ..	1·9	1·97	·08	..	..	..	..
Mean ..	1·70	1·92	·194	..	1·45	1·70	·136
Beerwah Sand.				**Beerburrum Fine Sand.**			
4496 ..	1·0	·90	·10	4418	1·2	1·71	·08
4497 ..	0·9	1·44	·10	4420	1·1	2·01	·09
4498 ..	1·1	2·69	·15	4423	2·7	1·16	·17
4500 ..	1·0	1·80	·12	4424	0·8	1·53	·14
4501 ..	1·3	2·15	nd	4425	2·3	1·35	·17
4502 ..	0·8	1·97	·10	4427	5·0	3·20	·12
4503 ..	1·0	2·15	·08	..	..	..	..
4505 ..	0·8	1·62	·13	..	..	..	..
4506 ..	0·7	2·69	·12	..	..	..	..
4507 ..	0·5	1·88	·16	..	..	..	..
Mean ..	0·91	1·92	·118	..	2·2	1·83	·128

The Glasshouse Sandy Loam is the most satisfactory type with regard to replaceable base, and the Beerwah Sand is quite the poorest. In this latter type it is noticeable that the magnesium has not been leached to the same extent as the other bases. There is evidence also, that, throughout the area, magnesium tends to replace calcium as the major exchangeable constituent.

The abnormal value for calcium of Beerburrum Fine Sand No. 4427 increases the mean for this type, but the sample was taken from the red phase which, as previously stated, is of very limited extent in the area surveyed.

(c) Phosphoric Acid.

Some seventy samples of surface soils were examined by means of Truog's method for available phosphoric acid. It was found that in three cases only did the available P_2O_5 exceed the abnormally low figure of 3 parts per million, and these three exceptions gave 6, 7, and 8 p.p.m. Since the figures are so low and since the very small differences were within the limits of experimental error, it is not necessary to tabulate the individual results.

Further evidence of the extreme lack of phosphoric acid is shown by reference to Table 11 (*a*), which sets out the content of P_2O_5 obtained by digestion with constant boiling-point hydrochloric acid of surface soils throughout the area. Out of forty-four estimations, only four are above ·04 per cent., the majority lying between ·01 per cent. and ·02 per cent. The maximum figure is only ·064 per cent., whilst the mean is ·019 per cent. The relation between these low figures and the sparseness of the natural grass cover and lack of organic matter in the profile is a question which suggests itself.

Experimental work has indicated that a content of 20 p.p.m. available P_2O_5 (Truog.) must be present in the soil before the response of pineapple plants to phosphatic fertilizers becomes negligible. Consequently, from the point of view of pineapple culture, these soils must be regarded as exceptionally deficient in phosphoric acid.

(d) Hydrochloric Acid Analysis.

A number of analyses of the standard hydrochloric acid extract were made on surface, sub-surface, and subsoil samples of typical soils from each type. Some of these results have already been given in Tables 1-4, whilst others are included in Table 12.

A large number of hydrochloric analyses of virgin soils from the area under review were also available from the records of the Agricultural Chemist branch of this Department. All these are surface soils. Although the data as to location was not always sufficient to fix definitely the type to which each individual sample belonged, in many cases the block or portion was recorded, and from the classification it was evident that a representative range of textures was included. These results are summarised in Tables 10, 11 (*a*) (*b*).

TABLE 10.

VARIATION TABLE FOR % P_2O_5, K_2O, CaO and MgO IN SURFACE SOILS.

——	Mean.	Minimum.	Maximum.	Number of Samples.
P_2O_5	·019	·001	·064	44
K_2O	·023	<·001	·08	44
CaO	·129	·04	·45	40
MgO..	·074	·013	·210	44

Table 10 shows that the mean values for phosphate, potash, lime, and magnesia are extremely low, and that even the maximum values, with the exception of calcium, are still below fertility requirements. The rather high figure of ·45 per cent. calcium is seen from the distribution Table 11 (*b*) to be an abnormal value.

TABLE 11 (*a*).

DISTRIBUTION TABLE FOR % P_2O_5, K_2O FOR SURFACE SOILS.

——	< ·01	·01	·02	·03	·04	·05	·06	·07	·08
P_2O_5 ..	4	19	9	8	1	2	1	..	..
K_2O ..	6	12	12	8	1	1	2	1	1

TABLE 11 (*b*).

DISTRIBUTION TABLE FOR % CaO, MgO FOR SURFACE SOILS.

——	<·05.	·05–·1.	·1–·15.	·15–·20.	·20–·25.	·25–·3.	·3–·5.
CaO	2	14	10	8	4	1	1
MgO	12	21	8	2	1	..	..

TABLE 12.

% ANALYSES OF HYDROCHLORIC ACID EXTRACTS OF SURFACE SOILS.

Type.	Sample No.	R_2O_3.	CaO.	MgO.	K_2O.	P_2O_5.
Glasshouse Sandy Loam	4435	6·47	·14	·07	·056	nd
	4468	9·37	·13	·10	·033	nd
	4450	4·72	·13	·08	·036	nd
	4455	8·45	·11	·11	·018	nd
Glasshouse Sand ..	4472	2·90	·13	·08	·025	nd
Beerwah Sand	4504	1·87	·12	·11	·038	nd
Beerburrum Fine Sand	3411	3·30	·08	·16	·01	·03
	3608	3·49	·16	·08	·006	·01
	3609	3·15	·19	·08	·003	·01
	3610	1·96	·22	·07	·03	·02

(e) Mechanical Analysis.

All these soils show a very considerable sand content on mechanical analysis. For the present purposes, an exhaustive texture examination necessitating a large number of analyses was not required. Typical samples from each type were examined, and a reliable check on field descriptions was obtained. The textures of the surface soils are summarised in Plate 199, where the particle sizes are illustrated in the form of summation curves. The predominance of the sand fraction is marked in all types, and with regard to the Beerburrum Fine Sand there is a definite widening of the ratio of fine to coarse sand. In the Beerwah Sand, of the two sand fractions, the coarse is in excess. This is well borne out by a large number of profile observations in the field. There is, in general, a flattening of the lower ends of the curves, indicating a low silt content, particularly in the case of the Glasshouse and Beerwah Sands. Moreover, there is a remarkable uniformity of silt content throughout the area with respect to surface, sub-surface, and subsoil samples, and this is further brought out in the distribution triangle (Plate 200), where all samples are restricted to an area adjacent to the clay-sand axis. The subsoil of the Beerburrum Fine Sand has the highest silt content and this factor, together with the wider fine/coarse sand ratio, has a definite influence on the textural characteristics of the type. The variation in texture in the Glasshouse Sandy Loam surface soils noted in the field is in line with the mechanical analyses results. The variation in clay percentage is from approximately 10 per cent. clay to 20 per cent., and although this range is not very great, the fact that it is accompanied by an increase in fine sand at the expense of the coarse fraction does give a definitely loamier texture in the field. This heavier phase is particularly noticeable on Portions 9, 10, and 90v.

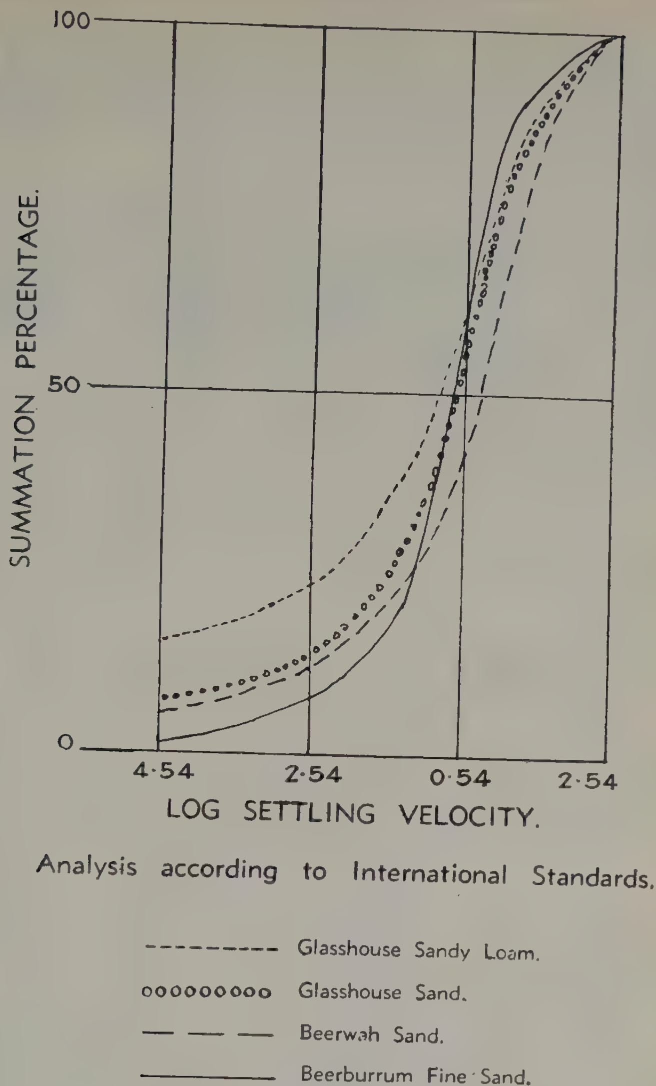

Plate 199.

Summation curves illustrating average mechanical analysis of surface samples of the various soil types.

The shape of the summation curves shows that there is no notable difference between the types, the greatest difference physically lying in the increased clay content of the Glasshouse Sandy Loam.

From Tables 1-4 it is apparent that there is a slight increase with depth in the ratios of fine sand—coarse sand.

Prescott, Taylor, and Marshall[3] have published a schematic diagram showing suggested relationships between textural classes and mechanical composition according to international standards. The portion of this diagram relevant to the soils under review has been superimposed, as a matter of interest, on the distribution triangle (Plate 200). The agreement for surface and sub-surface soils is particularly good. The greatest

discrepancy is with regard to the subsoil of the Glasshouse Sandy Loam, and this, as has been previously pointed out, is apparently of a more loamy nature than its high clay content would indicate. The explanation of this discrepancy is probably bound up with the considerable sesquioxide content. It is felt that its place is more truly in the loam/clay loam range.

The subsoils of the Glasshouse and Beerwah Sands are seen to be on the border of clay loam/sandy clay in the case of the former and clay loam/sandy clay loam in the latter, and this is in line with the recorded field observations. A close agreement also holds for the Beerburrum Fine Sand subsoil, although in the bottom 6 inches of the concretionary layer a slight increase in clay content seems to accentuate the stickiness of this fine-textured material.

The mechanical analyses, according to International Standards of typical surface soils, are given in Table 13; others are recorded in Tables 1-4.

TABLE 13.

MECHANICAL ANALYSES OF SURFACE SOILS ACCORDING TO INTERNATIONAL STANDARDS.

—	Glasshouse Sandy Loam.				Glasshouse Sand.	Beerwah Sand.	Beerburrum Fine Sand.
Coarse Sand ..	41·2	35·2	42·6	31·2	43·2	59·3	39·7
Fine Sand ..	35·5	34·4	37·1	37·6	42·3	27·3	48·6
Silt	9·2	7·5	7·3	5·0	3·9	4·9	7·3
Clay	10·9	19·2	11·2	19·2	7·5	6·1	1·1
Loss on Acid Treatment ..	·9	·3	·3	3·6	·6	·4	·8
Moisture	1·4	1·7	1·5	1·4	·5	·6	·8
Sample No. ..	4435	4468	4450	4455	4472	4504	4418

(f) Reaction, Buffer Capacity.

(i.) Reaction. There is a striking uniformity of pH values for the surface soils of all types. Reference to Table 14 shows that out of eighty-one estimations, sixty-two fall within the short range of pH 5·5 to pH 6·0, whilst there is a variation of just over one unit throughout the area. The arithmetic means given in the last column of the table show practically no difference from type to type with the exception of the Beerwah Sand. This soil, which is the lowest in base status, shows a slightly lower mean reaction value.

TABLE 14.

DISTRIBUTION TABLE OF pH VALUES OF SURFACE SOILS.

Type.	5·4.	5·5.	5·6.	5·7.	5·8.	5·9.	6·0.	6·1.	6·2.	6·3.	6·4.	6·5.	6·6.	Arith. Mean.
Glasshouse Sandy Loam ..	2	..	4	6	9	3	3	2	..	1	..	..	..	5·83
Glasshouse Sand	2	..	3	2	6	4	2	2	1	1	..	..	..	5·85
Beerwah Sand	2	4	3	..	4	1	1	..	..	..	..	..	..	5·66
Beerburrum Fine Sand ..	3	..	2	1	1	1	2	..	1	..	1	..	1	5·88
Total	9	4	12	9	20	9	8	4	2	2	1	..	1	..

It is interesting to briefly consider these pH values from the point of view of their relationship to the prevailing climatic conditions. Defining the climate in terms of the Meyer precipitation/saturation deficit ratio, the average figure of 290 calculated elsewhere in the text

would indicate sufficient excess of rainfall over evaporation for effective leaching. This has tended towards a removal of the bases, resulting in a greater degree of unsaturation and accentuation of acid properties.

All these pH values fall into line with the relationship between the precipitation/saturation deficit and reaction of a large number of Australian soils as defined by Prescott.[4] The reaction range of 5·5 to 6·0 of the soils from the area in conjunction with a Meyer ratio of 290 is a good fit in the diagram.

(ii.) Buffer capacity. The intimate connection between the availability of iron to the pineapple plant and the reaction of the soil in which it is grown is a vital factor in the successful production of pineapples. In the area under review, the assimilation of iron is a contributing factor in the resistance to pineapple wilt and, consequently, there is a marked correlation between crop production and soil reaction. This is particularly the case in those soils which have been under cultivation for a number of years, and which in consequence have been depleted in humus.

Since an important property of the soil organic matter is its role as a medium for increasing the cationic exchange capacity, it would be expected that soils of such a low humus content as those under consideration would be but weakly buffered. Under these conditions it is further probable that the buffering would be controlled by the colloid content.

That this is the case may be seen from Plates 201, 202, and 203, where some titration curves typical of each type are illustrated.

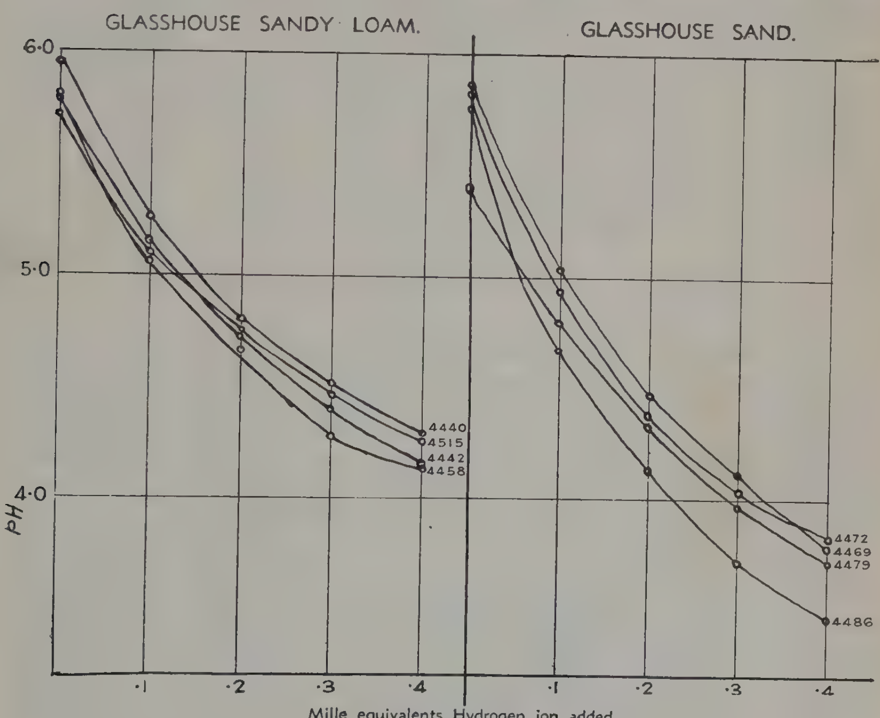

Plate 201.
Buffering curves of Glasshouse Sandy Loam and Glasshouse Sand.

To obtain the curves ·05N H_2SO_4 was added to 20 gm. samples of air-dried surface soil in increments corresponding to ·1 mille equivalent of hydrogen ion. The mixtures in duplicate were stoppered and shaken overnight, when apparent equilibrium was obtained. The pH was determined, using a saturated calomel-glass electrode system in conjunction with a Cambridge electrometer valve pH meter. The duplicates showed good agreement and were always reproducible.

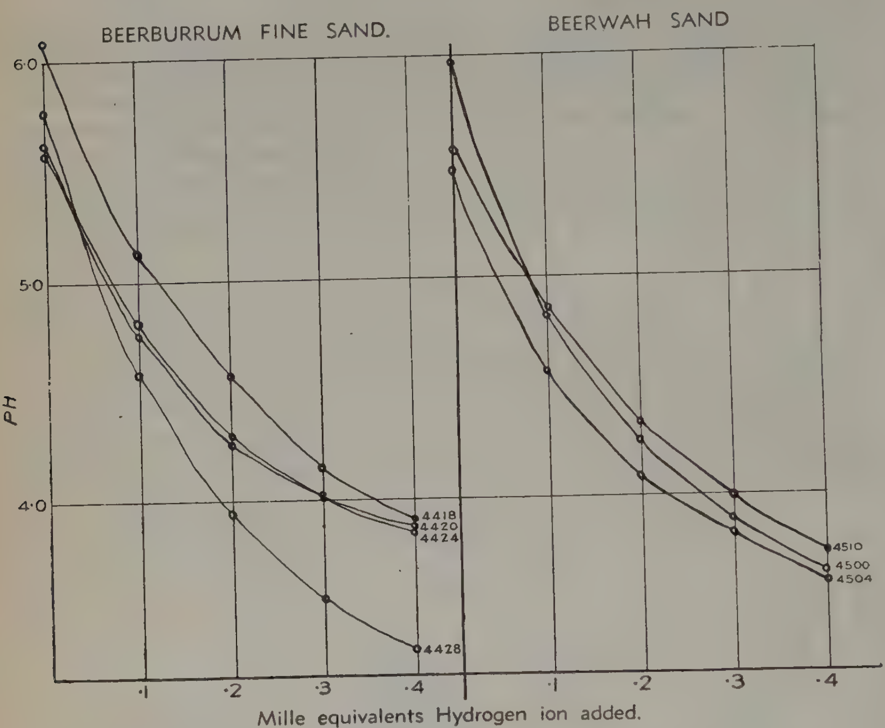

Plate 202.

Buffering curves of Beerburrum Fine Sand and Beerwah Sand.

The curves are very similar in nature, with a steady fall in the initial stages and a general tendency to flatten out in the very acid range, the increase in acidity being a uniform function of the added hydrogen ion throughout the range pH 4·0-6·0. For the sake of convenience, Plate 203 is appended, showing only that portion of the curve crossing the value of pH 4·5 for a number of determinations. This may be regarded as a straight line without appreciable error.

While there is some range within the soil types themselves, in general they fall into two main groups, the more highly buffered group being occupied by the heavier textured Glasshouse Sandy Loam, while the sandier types fall within a range of lower resistance to change in reaction. The Glasshouse Sand and Beerwah Sand required less than ·2 m.e. of hydrogen per 20 gm. soil to increase the acidity to pH 4·5, For the Glasshouse Sandy Loam a greater inactivation of added hydrogen ion is evident and a significantly flatter curve is obtained, an amount of ·25 to ·3 m.e. being required to produce the same effect.

The use of powdered sulphur for modifying the reaction of pineapple soils in Southern Queensland is rapidly being adopted as a standard practice. Previous work (unpublished) on a representative range of these soils has shown that there is a good correlation between the calculated equivalent of sulphur as indicated by the laboratory determination of the buffer capacity and the actual response to sulphur

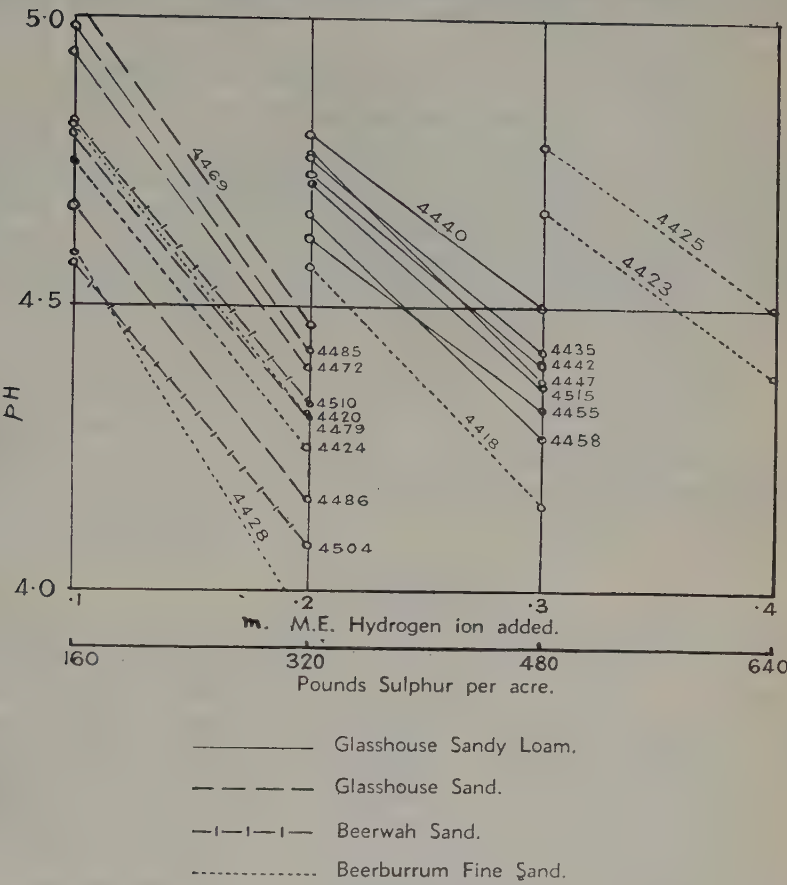

Plate 203.

Showing portion of titration curves and probable sulphur requirement of all soil types.

in the field. The depth to which the sulphur affects the soil reaction has, for the present, been arbitrarily set at 6 inches, and this depth on these sandy types of fairly high specific gravity postulates 2,000,000 lb. of soil per acre. Assuming complete oxidation in the field, the amount of sulphur required for any given area which will bring the reaction within the range, pH 4·5—5 may readily be determined. This range has been adopted as a working hypothesis from the results of a large number of field observations. If the sulphur is applied in a finely powdered condition, free from lumps, and intimately mixed with the soil to a depth of 3 to 4 inches, the desired reaction is reached within a period of four to six weeks in the summer months and slightly longer in the winter.

In these sandy soils of low and uniform organic matter content the sulphur requirement may be determined accurately enough in the field for practical purposes from a knowledge of the initial pH and texture classification.

Two samples, Nos. 4423 and 4425, from the red phase of the Beerburrum Fine Sand show abnormally high buffering power; these are also high in initial pH.

4. CLIMATIC DATA, MORPHOLOGY OF PROFILE.

(a) Climatic Data.

While it was not possible to obtain complete climatic data for the area itself, rainfall figures were available for the township of Landsborough, which is only three miles north of Beerwah, and for Caboolture, which, while some nine miles south of Beerburrum, is closely associated as regards soil type with the Beerburrum Fine Sand. For Beerwah the average annual rainfall and mean annual temperature for the period 1925-1928 was also available.

TABLE 15 (*a*).
RAINFALL DATA.

—	Years.	Jan.	Feb.	Mar.	Apr.	May.	J'ne.	J'ly.	Aug.	Sep.	Oct.	Nov.	Dec.	Year.
Landsborough	44	1,057	1,079	927	616	432	375	238	189	235	300	408	683	6,539
No. Wet Days	..	9	11	12	8	9	5	4	5	6	6	5	7	87
Caboolture ..	50	757	779	744	457	280	268	218	151	186	250	351	525	4,966
No. Wet Days	..	12	13	16	9	8	8	6	7	8	9	8	10	114
Beerwah ..	..	..	..	..	..	..	..	..	..	..	..	..	..	6,333

TABLE 15 (*b*).
TEMPERATURE DATA.

	—	Jan.	Feb.	Mar.	Apr.	May.	J'n.	J'ly.	Aug.	Sep.	Oct.	Nov.	Dec.	Year
BRISBANE	Mean Max. ..	85·4	84·5	82·3	79·0	73·6	69·3	68·5	71·3	75·7	79·7	82·8	85·1	78·1
	Mean Min. ..	68·9	68·6	66·3	61·5	55·3	51·0	48·5	49·9	54·8	60·0	64·2	67·4	59·7
	Rel. Hum. at 9 a.m.	66	69	72	72	73	74	73	69	64	60	60	62	68
GYMPIE	Mean Max. ..	87·6	86·4	84·7	81·7	76·4	71·4	71·4	73·9	78·8	83·5	87·0	88·4	80·9
	Mean Min. ..	66·5	66·4	63·4	57·7	49·8	46·3	42·2	44·4	50·2	56·2	61·4	64·9	55·8
	Rel. Hum at 9 a.m.	74	76	77	77	77	78	75	73	68	65	65	68	73
Beerwah, Mean	..	..	..	..	..	..	..	..	..	..	..	..	..	68·5

It will be seen from Table 15 (*a*) that there is a well-marked seasonal rainfall with a summer maximum. A decrease in mean annual rainfall occurs towards the south. It is unfortunate that there are no figures for intermediate stations, but it is to be expected that the diminution would occur just at the south of Glasshouse Mountains, where there would be a lessening of the influence of the Blackall Range. It was not possible to obtain very satisfactory figures for temperature and relative humidity within the area, but it is probable that the temperature and relative humidity figures of Brisbane may be applied to Caboolture and those of Gympie to Beerwah without a great deal of error. The mean average temperatures of Brisbane, Beerwah, and

Gympie are practically identical, although there is a somewhat greater difference in the 9 a.m. relative humidity figures for Brisbane and Gympie.

Using these figures to calculate Lang's rainfall/temperature factor, there is a variation from 80 at Beerwah to 62 at Caboolture. Meyer's precipitation/saturation deficit ratio is 333 for the former locality and 250 for the latter. Whilst the figures must be regarded as merely tentative, it is noticed that both factors fall just short of their respective limits of indices for podsols.

From a consideration of the rather high figure for precipitation per rainy day, which is ·74 inches in the northern region and ·44 inches towards Caboolture, it would be expected that there would be a marked topographical control affecting the soil types. Such is the case. The nature of the precipitation ensures a relatively lower percentage penetration on the elevated portions, the high run-off decreasing the leaching factor here in those portions, with a consequent concentration of the water at the lower levels. That there is a greater penetration and water movement in these lower levels is shown by the marked increase in the depth of the A horizons and obvious diminution in the sesquioxide content. This is borne out by the analytical data of the profiles, and a feature in the field is the lateral differentiation in colour down the slopes. It is noticeable that, except in small isolated areas occupying limited elevations, the red soils do not persist south of Beerburrum, where the terrain becomes featureless. Moreover, there is a marked drop of ·3 inches in the precipitation figures per wet day in this latter region.

(b) Morphology.

Whilst the nature of the work demanded that this investigation be carried out from an agricultural point of view, it is interesting to briefly consider the pedogenic factors involved.

In the first instance, although these soils are definitely podsolised, they cannot be regarded as true podsols. The low-base status and removal of sesquioxides from the A horizon are indicative of podsolisation, but several factors operate against the application of the term podsol as generally defined. Several of the distinguishing factors are absent, notably the A_0 horizon of peaty material and the humus B_1 layer.

The layer of iron accumulation is always present, either as a subsoil zone of enrichment or a nodular pan, in which the nodules are more commonly discrete ferruginous cemented particles of sand grains, rather than true concretions showing concretionary structure about a nucleus.

Beerburrum Fine Sand.—This type shows the strongest podsolisation of all the types studied. The removal of iron from the A horizon and its light colour is a definite characteristic of the type. As previously described, a concretionary iron pan is uniformly present throughout the area, and this horizon is devoid of organic matter.

An apparently similar ferruginous cementation of sand grains, occurring in the "shot" soils of Western Washington, is described by Wheeting[6], who attributes their formation to the precipitation and dehydration of soluble iron and aluminium compounds during the dry season. However, the Queensland pellets do not contain the high percentage of P_2O_5 recorded in the Washington occurrences.

In the Beerburrum Fine Sand it is significant that the concretionary zone occurs in close proximity to the upper portion of the clayey horizon which would be most subject to alternate water-logging and drying conditions. Periodic fluctuation in the water-table would permit the drying out of the upper sandy layer, with the introduction of oxidising conditions resulting in an irreversible precipitaton of sesquioxides. It is conceivable that such a process would not cause the precipitation of calcium and other bases, and their diffusion and removal would be effected during periods of water movement. A noticeable feature already mentioned is that in present areas of permanent swamp there is no development of a nodular horizon, and this is quite possibly due to the fact that anaerobic conditions are persistent in these areas.

Associated with the normal type of nodule is a smaller variety lustrous in external appearance and black throughout. These are more rare in occurrence, and are usually, but not always, scattered through the topmost portion of the concretionary layer. They are about the size of a pea and contain 15 per cent. Mn. calculated as Mn_3O_4 and no P_2O_5. The normal variety contain slight amounts of P_2O_5, but no trace of manganese was present in an aggregate sample of some typical specimens. The figures quoted in Table 16 show that aluminium has accumulated to an even greater extent than iron.

TABLE 16.

HYDROCHLORIC ANALYSIS OF CONCRETIONARY MATERIAL.

—	BEERBURRUM.		GLASSHOUSE.
	Normal.	Black.	
	%	%	%
Insoluble	44·0	34·1	44·9
Fe_2O_3	17·3	15·6	18·9
Al_2O_3	25·9	11·3	26·0
Mn_3O_4	Nil	15·6	·1
CaO	·35	trace	·5
MgO	·05	trace	·103
K_2O	·05	nd	·07
P_2O_5	·03	nil	·05
Ignition Loss	9·1	nd	9·8

Glasshouse Sandy Loam and Glasshouse Sand.—These two soils, and in particular the Glasshouse Sandy Loam, may be regarded as being but weakly podsolised. There is undoubtedly a marked relation between topography and removal of sesquioxides from the profiles. An obvious lateral diminution in colour is apparent in passing from higher levels to lower levels, the more podsolised Glasshouse Sand being confined to lower limits of slopes and flat country where leaching water remains longer in contact with the soil.

A striking feature is the deep-seated decomposition of the original parent rock. The basal rock consisted of grits and sandstones, and has been observed to occur in a comparatively fresh condition at depths of about 25 feet. Overlying this and reaching to within 9 feet of the surface is a red and white mottled horizon, approximately 15 feet thick. This material is apparently the result of the primary decomposition of

the sedimentary rock, and must be regarded as the parent material of the soil itself. Thus the soil profiles assume a secondary character with regard to the geological structure.

Immediately overlying this red and white mottled horizon and embedded in a red clayey matrix is a layer of concretionary material. This takes the form of thickly-studded, individual pellets 2 to 3 cm. in diameter, or, when not *in situ,* large irregular accretions closely resembling and likely to be mistaken for a ferruginous sandstone. Above this is the soil proper which, in the case of the Glasshouse Sandy Loam, remains red to within 3 to 4 inches of the surface and within about a foot of the surface in the case of Glasshouse Sand. The topographical characteristics of the Beerwah Sand, unfortunately, do not allow an inspection to be made of the deep-seated material.

A significant feature of the mottled horizon is the predominance of the white material in the lower portion with a marked increase in ferruginous colouration towards the top, culminating in the very red concretionary matrix and the concretions themselves. In considering the factors influencing the mobility of this iron, it is interesting to note that the pH of the red and white mottled horizons immediately below the concretions is 4·85. A sample taken from the depth 7 to 9 feet where rubble begins to appear was pH 5·4, and above this, in the concretionary horizon proper, the reaction increased to pH 5·9. Therefore, in this mottled horizon, where reducing conditions must persist, the reaction appears to be below the critical value for the movement of ferrous hydroxide, since this latter value is pH 5·5, and this material must be precipitated when reaching the zone of reaction 5·9. Thus, from a consideration of hydrogen ion concentration, it would appear that, if an upward movement of moisture may be postulated, conditions are such that mobility in the mottled horizon and precipitation in the concretionary layer would be ensured.

It is interesting to compare Glasshouse profile with the "Ilepa" profile described by Doyne and Watson[6] in Southern Nigeria. There appears to be a remarkable similarity with one striking difference, in that the Queensland formation is from sedimentary material, whilst the Nigerian occurrence is developed from acid igneous rocks. Here, intrusive and metamorphic granites are the parent materials of a profile which the authors describe as follows:—(*a*) Brown sandy soil, (*b*) concretion layer, (*c*) red clay, (*d*) mottled red and white clay, (*e*) whitish clay, (*f*) rotting rock. This is almost a word picture of the Glasshouse profile.

SUMMARY.

A soil survey has been made in the Beerburrum-Glasshouse Mountains-Beerwah area with especial reference to pineapple production in these districts.

The rainfall throughout the area varies from 50 to 65 inches per annum. It is sporadic in nature, and the precipitation per rainy day is considerable. A marked climatic feature is the incidence of summer rainfall.

The prevailing vegetation is that of eucalyptus forest. Low ridges of gentle slope and good drainage are definite physiographical features. The lower levels of these slopes and the intervening flat country are characterised by a swamp type of vegetation in which the tea-tree is the dominant species.

Four major soil types have been recognised, and are listed below in the order of their productivity:—

(*a*) Glasshouse Sandy Loam.
(*b*) Glasshouse Sand.
(*c*) Beerburrum Fine Sand.
(*d*) Beerwah Sand.

Topographically, each type is characterised as follows:—(*a*) Plateau-like areas of low elevation; (*b*) the gentle slopes of these plateau ridges; (*c*) low, flat areas south of Beerburrum; (*d*) the swampy areas which occur in the hollows between the ridge plateaux.

A dominant feature of the surface soils of all types is the open texture and high sand content. The clay fraction increases with depth, and the nature of the lower horizons is a distinguishing characteristic of each soil type. The subsoil of the Glasshouse Sandy Loam is physically good, but in the Beerburrum Fine Sand the existence of a concretionary iron layer impedes the percolation of water through the deeper horizons.

The Beerwah Sand may contain over 80 per cent. of sand to a depth of 3 feet, followed by an appreciable increase of clay in the next horizon. This fact, together with the low-lying nature of its occurrences, increases the danger of periodic water-logging in continued wet weather and, consequently, it has little value for agricultural purposes.

A large number of samples, typical of the soil types, has been submitted to laboratory investigation. An outstanding feature is the low content of organic carbon. The figures for nitrogen are grouped about the extremely low value of ·05 per cent., while the majority of the organic carbon estimations range from ·75 per cent. to 1·5 per cent. The C : N ratios are very wide, and indicate that a comparatively large proportion of the organic matter is present as undecomposed woody material and inert charcoal. Because of the sandy texture of these soils, and the paucity of humus in the surface horizons, they are characterised by extremely low water-holding capacities. This fault is further accentuated by the prevailing climatic features of high temperature and evaporation. Since the districts surveyed are frequently subject to prolonged periods of dry weather, the necessity for cultivation practices designed to conserve surface soil moisture is apparent.

The low base status of these soils, resulting from the high degree of leaching to which they have been subjected, is demonstrated by a large number of chemical analyses. There is a marked dearth of phosphoric acid, and in many cases the content of available P_2O_5 is too small to be satisfactorily estimated. The soils are also very deficient in both total and replaceable potash. The mean value for total potash does not exceed the low figure of ·023 per cent., while the majority of estimations of replaceable K lie within the range, ·05 m.e. to ·20 m.e. per 100 gm. of soil. Owing to the extremely low plant food content of all of these soil types, heavy fertilizing is necessary when they are used for agricultural purposes.

A remarkable uniformity in pH values is a feature of the soils of the area, and these values are distributed very closely about the mean pH 5·8. Since this is somewhat greater than the indicated optimum

pH for pineapple growth, the buffer capacities of a number of typical samples have been determined. This determination provides a reliable indication of the amount of sulphur required per acre to increase the acidity of the surface soils to a given pH. It was found that, since the organic matter is uniformly low, the amount of sulphur required varies not only with the value of the initial pH but also with the clay content.

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Plate 204. [*Photo.: L. F. Andersen.*

Farm Buildings on the Ovaltine Estate, England.

Some Aspects of Pest and Disease Control in Tobacco.

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THE question of pest and disease control is one of major importance in all phases of agriculture, and this is especially so in the case of a crop such as tobacco, where the marketable portion of the plant is the leaf. The leaf of the tobacco plant is particularly susceptible to damage by quite a number of organisms which affect it directly, while it may also be indirectly affected by certain organisms which attack other parts of the plant, and, in so doing, derange normal physiological processes. While much may be gained by the prompt application of proved remedial measures when the first signs of attack are in evidence, the losses incurred would be still less were it possible to prevent the attack altogether. It is the aim of these notes to consider such practices as will assist in bringing about some measure of insurance against losses of this nature. For convenience the whole problem may be considered under four main headings—namely, (1) over-wintering of harmful organisms, (2) host resistance, (3) protective measures, and (4) cultural methods.

Over-wintering.

In order that they may survive the winter, some pest and disease organisms require the protection of plant tissues, either living or dead. Others are able to survive in the soil itself for considerable periods, even under unfavourable conditions. It is obviously desirable that conditions on the farm should be made as unfavourable as possible for the survival of harmful organisms and strict attention to field hygiene plays an important part in attaining this condition.

Some organisms which require a living host on which, or in which, to hibernate are restricted to the genus *Nicotiana*—which includes the cultivated tobacco plant—while others have a much wider range of hosts. In most districts where tobacco is grown extensively, the area devoted to other commercial crops is comparatively small. Hence, by restricting the growing of tobacco to that period of the year known to give the best results, several months would remain during which no tobacco would be growing. This practice tends to reduce the survival of harmful organisms from season to season.

As soon as possible after the completion of harvesting in any part of the cultivated area, the old stalks should be uprooted and then burnt later on as soon as they have dried out sufficiently. The longer these stalks remain in the field, the greater will be the risk of some pests, e.g., the leaf miner and the stem borer, completing their development and the greater the risk of contaminating the soil by disease organisms. It has been proved, for instance, that the spores of *Cercospora nicotianæ*, the fungus responsible for "frog-eye" leafspot, may be carried over in this fashion to infect subsequent crops of tobacco. It is provided in "*The Tobacco Industry Protection Act of* 1933" that "every occupier (or where there is no occupier, then the owner) of land used in the growing of tobacco plants shall, within one calendar month after the leaf has been harvested from the plants

growing on such land, uproot the whole of the plants on such land and destroy such plants in a manner to be prescribed,'' which is by burning. It should be unnecessary to invoke the provisions of this Act in inducing growers to carry out work of this kind which is essential for their own protection.

As mentioned previously, the soil may harbour many of the organisms harmful to tobacco. Fungus spores accumulate in the soil and certain insects pupate in it; if there is no suitable host plant available, nematodes may survive for long periods of time in the soil alone. Under ordinary conditions many of these organisms will be afforded sufficient protection by the soil cover to survive the winter months, though most of them would be destroyed if exposed to the hot rays of the sun for any length of time on the surface of the soil. Besides keeping the land in good tilth, frequent cultivation destroys large numbers of harmful organisms, and regular cultivation is an important factor in reducing losses. The land should therefore be ploughed as soon as practicable after the destruction of the tobacco stalks. If this operation is delayed too long, the soil may have dried and hardened to such an extent that ploughing is both more difficult and less effective. If a crop is to be grown on the land during the next season, it is advisable to follow the first winter ploughing with several further cultivations. The final ploughing should not be carried out until the land has received a fall of rain. Apart from its value in pest and disease control, thorough cultivation assists in reducing weed growth in the crop and, as a consequence, it should be possible to discontinue inter-row cultivations before the crop is too large to permit the use of cultivating implements without injuring the roots.

In most tobacco-growing areas the problem of nematode control is important. These pests possess remarkable powers of survival and their complete eradication in the field is quite impossible. Nematodes are particularly common on light sandy soils and are there found infesting most natural weeds. At the present time no economic chemical treatment is available for their destruction, and recourse must be had to some system of control dependant on starvation, which may be brought about by bare fallowing over a period of several seasons or by growing crops resistant to infestation. Furthermore, tobacco soils in general are very low in humus content, and it is most desirable to replenish the humus of the soil after two or more tobacco crops; otherwise leaf of rather inferior quality is likely to be produced. Some system of crop rotation should be adopted which will serve the dual purpose of assisting in the control of nematodes and adding organic matter to the soil. The range of plants resistant to nematodes is limited and includes most Gramineæ (e.g., Sudan grass, maize, sorghums, millets, and wheat), velvet beans, a few varieties of cowpeas, sunn hemp, and peanuts. Of the legumes, peanuts have proved quite satisfactory in every respect, though rank growth sometimes occurs in the following tobacco crop. However, as a safeguard it is an advantage to follow peanuts with a graminaceous crop such as Sudan grass (or wheat if climatic conditions will permit). This would mean a three-year rotation as follows:—tobacco, peanuts, Sudan grass, tobacco, &c. Such a rotation keeps the land free from cultivated nematode-susceptible hosts for two seasons in a three-year cycle, and the nematode population in the soil should be considerably reduced when the tobacco is subsequently planted.

Host Resistance.

Plant breeding and selection may play an important part in controlling pests and diseases of tobacco. Certain experimental work along these lines has given promising results in the United States of America. There is considerable scope for extensive work in connection with breeding in tobacco, and as time goes on disease-resistant strains and varieties may be evolved. Projects of this kind are particularly difficult, for the quality of the leaf must be maintained in all genetical work aiming at the production of varietal types resistant to pests and diseases. Progress must therefore be relatively slow.

Protective Measures.

The quality of the crop grown in the field is, to a large extent, determined by the health and vigour of the seedlings planted out, and every endeavour should be made to produce seedlings free from disease and insect attacks. The grower should make certain that the seed has been properly sterilized before sowing. Incidentally, tobacco seed supplied by the Department of Agriculture and Stock is always surface-sterilized with silver nitrate prior to distribution. The seedbed soil should be well sterilized by burning and by the application of Cheshunt mixture as an added precaution against the development of "damping-off." As soon as the young seedlings are above ground, care should be taken to see that the mothproof covers are placed in position before dusk each evening as a protection against the moths of the stem-borer and the leaf-miner. Neither "colloidal copper" spray nor benzol vapour has been proved to completely eradicate blue mould once it has appeared in a seedling, and, in any case, by the time outward symptoms are apparent a certain amount of damage has been done to the tissues of the plant. Therefore, the appropriate treatments should be commenced shortly after the plants are established and continued until the time of planting out. When the plants are large enough regular applications of appropriate insecticidal sprays or dusts should be made as often as necessary.

Once the crop is in the field, a routine operation should be that of regular dusting with lead arsenate for the control of stem-borers, leaf-miners, and leaf-eating caterpillars. If necessary, Paris green-bran baits for cutworms should be laid around the plants in the field. Later, when the plants are larger, dusting must be discontinued and replaced by a lead arsenate-pollard dry bait in order to minimise the risk of contaminating the cured leaf by arsenicals. During the earlier stages of growth regular pruning is necessary, and on no account should the primed leaf be thrown on to the ground where it may serve as a continuous source of infection to the growing crop. The primed leaf should be collected into heaps well away from the crop, and, when dry, burnt. Alternatively, the primings should be buried to depths which will prevent subsequent disturbance. It has been claimed by some growers that leaf dropped to the ground rapidly dries out and the organisms are destroyed. However, this would only be true under exceptional circumstances, and spores of parsitic fungi may often be found on uncollected primings after some weeks. Similarly, any insects which have already pupated, or are about to pupate, on primed leaves may survive and eventually reinfest the crop.

One factor in the predisposition of tobacco to disease in the field is that of drainage, and this is a point which is often overlooked by

growers. Provided that the land is not obviously poorly drained, the grower is usually satisfied that the natural drainage is sufficient, and in certain seasons this may be so. However, the risk is too great, and provision should be made for those seasons when heavier rainfalls may be experienced. Under heavy wet conditions where inadequate drainage is provided, the crop is prone to serious losses from blue mould and "frog-eye" leafspot, and under extreme conditions to a condition termed "drowning" or "wet feet."

Cultural Methods.

Since the plant's natural resistance to diseases and pests is considerably modified by its general health and vigour, this aspect of the problem should on no account be overlooked. A weak plant is much more susceptible to disease than one which is making vigorous growth; especially is this the case where one is concerned with a weak parasite —as, for example, the fungus causing "frog-eye" leaf-spot.

The area grown should be commensurate with the facilities for adequate cultivation and harvesting.

Cultivation should be commenced as soon as the young transplants are established in the field in order to promote rapid and extensive root growth, which will fit the plant to withstand dry conditions later. In North Queensland, there is much evidence in favour of early deep cultivation and soil aeration as practised in the United States of America. Cultivation should be continued at regular, frequent intervals until the crop is at least knee-high, though the implements must be set correctly to obviate any damage to the root system.

General Considerations.

In order that tobacco-growing may become an established industry, the element of chance should be reduced to an absolute minimum. Consequently, any measure which will minimise the risk of a failure must be considered worthwhile. No doubt seasonal conditions will always play a part in determining the degree of success attained, but they do not normally explain the whole difference between success and absolute failure, for a good grower is seldom completely at the mercy of the elements, because he practises good farming methods which both offset the effect of adverse seasons and extract the maximum benefit from favourable growing conditions.

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Insecticides.*

ROBERT VEITCH, B.Sc.Agr., B.Sc.For., F.R.E.S., Director of Plant Industry (Research).

THE function of insecticides is to kill the insect pest without inflicting appreciable injury to the insect's host, whether it be plant or animal. Insecticides used to eliminate insect infestation in manufactured goods or stored products must also be capable of being employed with a similar degree of safety to the treated article. Furthermore, the cost of the chemical and its mode of application must be such as to render its use economically practicable. It is also essential that the insecticide be applicable with a reasonable degree of safety to the operator, and finally it must not leave spray residues likely to be injurious to the subsequent consumer or user of the treated plant tissue, foodstuff or manufactured article.

Insecticides are usually classified as stomach poisons, contact insecticides, and fumigants. The stomach poisons are employed against insects which bite off and swallow portions of the plant on which they are feeding. Contact insecticides, on the other hand, are used mainly for the control of insects which feed by piercing the skin of the host plant and sucking the sap from the underlying tissue. Fumigants may be employed against both the biting and sucking type of insect.

It is not intended to discuss all the insecticides that are available, but rather to indicate the characteristics and uses of the more generally employed materials.

The manner, time, frequency, and other details of the mode of application of these insecticides, together with the precautions to be observed in using them, are further discussed in various departmental publications dealing with the pests against which they are employed.

Arsenate of Lead.

Arsenate of lead has for many years held pride of place as the most suitable form in which to apply arsenic as a stomach poison for the control of insect pests that feed by chewing. It remains in suspension in a spraying mixture reasonably well; it does not readily burn the foliage of treated plants, and it generally kills quite satisfactorily. It can be used with safety for the control of a number of important insect pests, but it must not be employed in such a manner as to leave injurious quantities of spray residue on the portions of plants intended as food for man or beast, because both the arsenic and the lead in this spray are highly poisonous.

This insecticide can be purchased either as a powder or a paste, and if obtained in the powder form, the purchaser must make sure that every particle of the powder is well moistened before being added to the water when the spray is being prepared. The best procedure is to gradually add small quantities of water to the powder until a thin paste, free from lumps, is obtained. This paste can then be thinned further and finally added to the water required to make up the desired strength of spray, the spray being thoroughly agitated while being applied.

* Reprinted from Vol. III. of "The Queensland Agricultural and Pastoral Handbook," published by the Department of Agriculture and Stock, Queensland, in 1938.

Various strengths of arsenate of lead spray are used, one of the commonest and most satisfactory formulae being arsenate of lead powder 1½ lb. and water 50 gallons. When the arsenate of lead has been purchased in the paste form, then 3 lb. must be used to 50 gallons of water.

Arsenate of lead may be combined with Bordeaux mixture in cases where the grower desires to control chewing insects and certain fungous diseases by a single application of a combination spray. The best procedure in such a case is to prepare the Bordeaux mixture in the usual manner and to add to it the required amount of arsenate of lead, the addition to the Bordeaux mixture taking place in the spray tank, the agitator of which should be kept running while the arsenate of lead is being added. In computing the amount of arsenate of lead required the Bordeaux mixture should be regarded as being the equivalent of an equal number of gallons of water.

Arsenate of lead and nicotine sulphate also form a useful combination in cases where a single application is required for the control of chewing insects and certain species of sucking insects. The soap usually employed in the preparation of a nicotine sulphate spray must, however, be omitted in this case because its presence in the combined spray would lead to the production of water-soluble arsenic with consequent spray injury. As a substitute for the soap, hydrated lime has been recommended at the rate of 2½ lb. to 50 gallons of the spray mixture. The hydrated lime will serve to liberate the nicotine from the nicotine sulphate, a reaction that is so essential to the successful application of a spray containing nicotine sulphate.

A third combination in which arsenate of lead sometimes features is an arsenate of lead and oil spray. This combination possesses certain disadvantages, the chief of which is that the presence of the oil renders an arsenate of lead residue difficult of removal and the spray residue problem in marketed fruit is correspondingly accentuated. Furthermore, the combination in the case of certain oils may lead to the liberation of water-soluble arsenic, the presence of which will cause spray injury.

Lime sulphur and arsenate of lead is a frequent combination for the control of certain fungous diseases and insect pests in deciduous fruit orchards. Spray injury may, however, follow on the production of water-soluble arsenic, formed, presumably, as a result of the interaction between the lime sulphur and arsenate of lead. To obviate such a possibility the addition of hydrated lime has been recommended at the rate of 2 lb. of hydrated lime to each 1 lb. of arsenate of lead, this mixture being worked into a paste with water and added slowly to the lime sulphur in the spray tank, the agitator of which is kept running. It is further recommended that no delay should occur in the application of this spray once it has been prepared. The arsenate of lead and lime sulphur spray is also sometimes used in citrus orchards, generally for the control of Maori mite or red spider and some chewing insect, although occasionally the lime sulphur is included in the combination in order to control certain scale insects.

Arsenate of lead is also used very extensively as a dust, several good proprietary lines, containing the arsenate of lead at strengths ranging from 14 per cent. to 70 per cent. being on the market. A convenient carrier for the dilution of arsenate of lead in the preparation

of a dust is hydrated lime, and any farmer desiring to make up his own dust may do so by thoroughly mixing the correct quantities of the two ingredients; e.g., a 25 per cent arsenate of lead dust may be prepared by mixing one part by weight of arsenate of lead with three parts of hydrated lime. Mixing must be thorough and may be conveniently accomplished by vigorously rotating a sound box or barrel partly filled with the ingredients to which several large round stones have been added.

Calcium Arsenate.

Calcium arsenate is an arsenical which is now frequently employed overseas for dusting purposes, particularly for the control of cotton pests. It is not quite such a stable compound as arsenate of lead, and it is generally considered that it should be used only when fresh supplies are available. It has not yet entered into common use in Queensland, and its further discussion is at present unnecessary; it may, however, become more extensively used in this State in future.

Cutworm Bran Bait.

An excellent form in which to use an arsenical insecticide is obtained by incorporating Paris green in a mixture of bran, molasses, and water. The bait thus prepared is very attractive to cutworms and army worms, and effectively deals with these pests in a wide range of field crops including cotton, tobacco, and tomato.

Paris green was formerly used as an arsenical spray, but for that purpose it has been almost entirely displaced by arsenate of lead, which is not so liable to burn foliage and which, moreover, remains in suspension much better than most commercial grades of Paris green. The latter insecticide, however, is more toxic, and is accordingly used in the preparation of bran bait for cutworm control, because in the case of bait placed on the ground the factors which render Paris green unsatisfactory in a spray are of no consequence.

The bait may be prepared by thoroughly mixing 25 lb. of bran and 1 lb. of Paris green while still dry. Molasses to the extent of 3 or 4 lb. is then mixed with water, and this is added to the dry bran and Paris green, the whole being well mixed, care being taken to ensure that only enough water is used to obtain the right consistency. It will generally be found that only 2 gallons of water is required to produce the desired consistency for the quantity of bran mentioned. The bait should be crumbly and not over-moist, thus permitting it to trickle through the fingers.

It should be scattered in the late afternoon so as to be fresh and attractive when the cutworms emerge from the soil to feed about sunset. It is somewhat difficult to definitely state the amount of bait required per acre, this depending mainly on such factors as the intensity of the infestation, the nature of the attacked crop, and on whether the bait is to be broadcasted or applied in rows. The economics of the crop requiring protection will also frequently determine the amount of bait that can be profitably used. However, as a rough guide to the farmer, it may be stated that 50 lb. dry weight of bran per acre should prepare sufficient bait for a light broadcast, but when the bait is sprinkled in the rows of plants requiring protection half that quantity may suffice if the rows are 4½ feet apart. Much heavier applications may sometimes, however,

be necessary on portions of the baited area where the infestation is abnormally high. There may thus be a very considerable variation in the rate of application, even in a single area.

As a precautionary measure poultry should not have access to a field in which bran bait has recently been scattered; any tendency to danger, however, is largely dependent on the method and density of bait distribution. All domestic animals should be kept away from the containers in which the bait has been prepared until these have been emptied and thoroughly cleansed.

Further details regarding the use of this bait will be found in departmental publications dealing with cutworms and army worms.

Grasshopper Bran Bait.

A different type of bait is employed for the control of grasshoppers, the arsenical in this case being arsenic pentoxide, a favourite in Queensland because of its frequent availability on the station or farm. The formula for this bait is arsenic pentoxide ½ lb., molasses 4 lb., bran 25 lb., water 2½ gallons. The molasses in this formula may be increased to 6 lb. in dry districts particularly if a plentiful supply is available. The arsenical is dissolved in a pint of boiling water in a kerosene tin or other container of suitable size, the molasses being similarly mixed with the same quantity of boiling water in a second container. Both the solutions are thoroughly stirred and half the balance of the water, i.e., 1⅛ gallons, is added cold to each container, the solutions being again well stirred. The next step is to add the molasses solution to the arsenical solution, this being accompanied by further stirring. The bran is then spread on a mixing board or sheet of iron and the arsenic and molasses solution is added to the bran, the whole being thoroughly worked up until a moist loose mash is obtained, the consistency of the mash being such as to permit of its trickling readily through the fingers.

The bait prepared according to the directions given is broadcasted somewhat in the same manner as in the hand-sowing of wheat, and is uniformly applied in a very finely divided state wherever the young grasshoppers are present in appreciable numbers. Experience indicates that the amount of bait prepared according to the formula given above is sufficient for the treatment of about two-thirds of an acre of infested ground.

The mixing of this bait should not be done by hand, and tin scoops or other implements should be used for manipulating the arsenic. A wise precaution consists of smearing the hands with petroleum jelly before preparing and broadcasting the bait, the hands being thoroughly washed after the work has been completed. The precautions with respect to domestic animals mentioned in the discussion of the cutworm bran bait should also be observed in the case of the grasshopper bran bait.

Further details regarding the application of this bait for combating grasshoppers will be found in the departmental leaflet on the control of these pests.

Swabbing Mixture.

A swabbing mixture which may be employed in cotton fields for the control of pests such as the corn ear worm and the cotton web-spinner is prepared by mixing 1 lb. of arsenate of lead and 1 gallon of

molasses with 6 gallons of water. Its mode of application will be found discussed in some detail in departmental publications dealing with cotton pests and their control.

Sodium Fluoride.

An insecticide of minor importance is sodium fluoride which acts mainly as a stomach poison although it is believed to possess some slight value as a contact insecticide. It has been suggested as a substitute for arsenicals in baits prepared for the control of cutworms and grasshoppers, but its chief use in insect control is in the destruction of cockroaches. It is somewhat poisonous to human beings and must therefore be used with discretion in dwelling houses. Various proprietary insect powders having sodium fluoride as the active principle are on the market.

Silverfish Bait.

A recently introduced silverfish bait which has proved successful in Australia is prepared according to the formula 1 oz. flour, $1\frac{1}{2}$ oz. sugar, 10 fluid oz. water, $\frac{1}{4}$ oz. barium fluosilicate or $\frac{1}{8}$ oz. zinc borate. The flour, sugar and water are heated to form a warm paste to which the poison is added, the mixture being then spread on small strips of white cardboard. Discretion should be exercised in the use of this bait on account of the poison which it contains.

Barium Carbonate.

Barium carbonate is a poison very frequently employed in the preparation of bait for the control of rats and mice. It is cheap and effective and is generally used in the form of a biscuit prepared by mixing one part by weight of barium carbonate with three parts of flour. These ingredients are mixed together, sufficient water being added to enable a stiff dough to be prepared. This dough is then rolled out to the thickness of a quarter of an inch and is cut up into pieces half an inch square. Finally these small biscuits are dried in the sun or in an oven and are then ready for use. Although much less dangerous than most other poisons employed in rodent bait, barium carbonate biscuits must nevertheless be handled with care and should not be placed within reach of domestic animals or children.

Red Squill.

Another rat poison is obtained from the fleshy bulbs of a wild plant growing on the shores of the Mediterranean Sea. This plant is known as the red squill or sea leek and it provides an efficient rodent poison which is readily eaten by rats and mice. Red squill can be obtained as a powder or as a liquid, such substances as fish, steak, bran, and oatmeal being used in the preparation of the bait. A commonly employed bait is obtained by mixing 1 oz. of powdered red squill with sufficient water to produce a thin paste which is added to and well mixed with 1 lb. of fresh finely chopped up meat. Another formula is 1 oz. of powdered red squill and 1 lb. of oatmeal, bran, or some other cereal meal, the ingredients being mixed dry and then moistened by the addition of a pint of milk or water. A third form of bait is obtained by cutting $\frac{1}{2}$ lb. of bread into $\frac{1}{2}$-inch cubes and mixing it with a pint of liquid red squill. Red squill varies in toxicity, and the formulæ just quoted are based on the assumption that the red

squill used in the preparation of the bait is of high toxicity. Although red squill is the safest material to use in rodent control it should be used with discretion in its application.

Resin-Caustic Soda-Fish Oil.

A departmental spray prepared according to the following formula has recently been evolved for use against the bronze orange bug and other citrus pests, more particularly scale insects:—10 lb. resin, 3 lb. caustic soda of good commercial quality, 1½ lb. herring or other fish oil, and 40 gallons of water.

The resin should be finely ground up before commencing operations, the next step being to dissolve the caustic soda in 2 gallons of water, to which the resin is slowly added while the mixture is boiling quietly. The mixture should be stirred during boiling to prevent solids adhering to the container. A creamy coloured scum forms on the surface of the mixture, the boiling of which should continue until a clear dark solution can be detected beneath the surface scum. The herring oil is added to this solution, and the whole mixture is then boiled for a few more minutes to make sure that no free oil is left. This quantity of concentrate is then available for dilution with 38 gallons of cold water. In preparing the concentrate, it is well to remember that the gently boiling solution expands, and therefore the selected container should be only half full if boiling over is to be avoided.

It will be noticed that a large quantity of solid matter is deposited as the concentrate cools off, hence if the concentrate is being prepared on a large scale necessitating its division into lots for subsequent dilution, it is suggested that the division be made while the concentrate is still hot. If divided into 2-gallon or 3¾-gallon lots, there will be sufficient concentrate in each lot to make up the 40 gallons or 75 gallons respectively, which represent the capacity of most Queensland spray tanks.

This concentrate cannot be kept satisfactorily except in airtight containers, and when such are not available the fish oil should not be added if the grower desires to store the concentrate. In such a case the concentrate should be prepared as directed except that the fish oil should be omitted for the time being. This modified concentrate is then stored and reheated when required, the herring oil being added at reheating and boiled as before for a few minutes to ensure that no free oil is left.

This spray must be carefully prepared, and it is essential that the clear, dark liquid be obtained as described. It can be applied with safety except during very hot weather, and its application should cease when the temperature exceeds 90°F. When the spray is being applied the agitator should be kept running. Smearing the hands with petroleum jelly is a procedure that should be adopted before preparing the resin-caustic soda-fish oil spray.

Oil Sprays.

Oil sprays have practically eliminated such old favourites as kerosene emulsion, and reliable proprietary brands of these sprays are now available at most orcharding centres in Queensland.

The proprietary oil sprays marketed in Queensland are obtained by selecting petroleum oils in various stages of refinement and adding either soap alone or soap in combination with some other substance, the objective

in both cases being to facilitate the formation of a stable emulsion when mixed with water. Earlier spraying oils were known as red oils, but in recent years the so-called white oils have largely displaced the red oils. There is not so much to choose between the red oils and the white oils in so far as the kill of scale insects is concerned, but the white oils, containing oils of a further stage of refinement, can undoubtedly be used with a much greater degree of safety to the tree. The objective aimed at by the manufacturers of these oil sprays is to obtain as high a percentage mortality in the scale insects as is possible without unduly reducing the margin of safety to the tree, and in this respect a reasonable compromise has generally been achieved.

The preparation of an oil spray for application in the orchard commences with the accurate measurement of the oil and water required. The oil is poured into a tin, and twice its volume of water is added, this mixture being forced through a fine nozzle of a bucket pump or poured from one container to another several times until a satisfactory emulsion is obtained. The mixture is then added to the balance of the water which is already in the spray tank. Growers are reminded that the manufacturers' directions should be carefully read before preparing and applying the spray.

Oil sprays should be applied in a well emulsified condition, and the operator should make certain that the spray mixture is kept efficiently agitated while being applied. An accumulation of surplus oil at the base of the tree may cause injury to the lower portion of the trunk and the adjacent portions of the root system, this injury being particularly liable to occur in the case of young trees. It can, however, be obviated by earthing up round the base of the trunk before commencing operations and removing the soil soon after spraying. Trees should not be sprayed with oil when experiencing dry conditions, and in the case of citrus it is not desirable to use oil sprays during the dormant period. Furthermore, the use of these oils during high summer temperatures is attended with danger. Healthy well-watered citrus trees may be sprayed with white oils at a temperature close on 100°F., but, in general, spraying with oils should be confined to cooler weather. It is also well to remember that sickly trees are more liable to spray injury than healthy trees.

Oil and nicotine sulphate may be used as a combination spray, but as stated when discussing arsenate of lead, a mixture of an oil spray and arsenate of lead possesses certain disadvantages and dangers.

For many years lime sulphur and oil were regarded as constituting a dangerous combination, and indeed in the case of many oils this is still so. Certain proprietary oils, however, are now being marketed as safe for mixing with lime sulphur. Such a combination spray is a very useful one but it should be employed with considerable care, and should not be applied while high temperatures are ruling. Experience indicates that the maximum temperature at which this combination spray may be used is in the vicinity of 90°F., but it is better to cease its application before that temperature has been reached.

Oil is now frequently added to Bordeaux mixture when the latter is being used in citrus orchards. The application of Bordeaux mixture for the control of fungous diseases of citrus unfortunately tends to markedly increase scale infestation, and, in order to obviate such an eventuality, 1 per cent. of a good oil spray is frequently added to the mixture. The oil is first well emulsified in double its own volume of

water and is then added to and well stirred into the Bordeaux mixture. Care must be taken to ensure that no free oil is present in the spray while is is being applied.

The application of an oil spray may follow the fumigation of citrus trees within a few days and fumigation may follow an oil spray after a similarly brief interval, but it is better to allow at least two weeks to elapse between each treatment. Normally, however, there should be no necessity whatever for the two treatments to be given at such a brief interval as two weeks. An oil spray should not be used immediately after or before the application of a lime sulphur spray or a sulphur dust, and a period of at least one month should elapse between the two treatments.

Should Bordeaux mixture and oil be applied as separate sprays in citrus orchards at least two months must elapse betweer the application of the Bordeaux mixture and the subsequent use of an oil spray. When the oil spray is applied before the Bordeaux mixture the interval may be somewhat shorter, but it is seldom necessary to apply these two sprays in that order.

Spraying oils are most commonly used for the control of scale insects on citrus, but they are also similarly used on deciduous fruit trees at certain seasons of the year.

Kerosene Emulsion.

Kerosene emulsion was for many years generally employed for the control of scale insects and aphids, but for such purposes it has now been very largely supplanted by other insecticides. There are, however, still occasions on which growers may desire to use it for it possesses the great merit of being prepared from ingredients obtainable at any country store.

A formula frequently used in its preparation is ½ lb. hard soap, 1 gallon water and 2 gallons kerosene. The soap is added to the water and dissolved therein by boiling. This mixture is then removed some little distance from the fire, and the kerosene is added while the soap solution is still hot. The soap, water, and kerosene are then thoroughly emulsified by churning up for five or ten minutes by means of a small spray pump or syringe. A thorough emulsion must be obtained, otherwise the presence of free oil will cause foliage injury. Although the stock solution prepared in the manner just described may keep for some time, it is generally considered desirable to prepare it as required.

The stock solution has to be diluted prior to use, the proportion of water to be added being determined by the species of plant to be sprayed and the species of pest to be destroyed. Some investigators claim that no greater strength than one part of stock solution to fifteen parts of water should be used, while others consider a one to ten strength reasonably safe.

When discussing oil sprays a suggestion was made as to how an accumulation of potentially injurious spray at the base of a tree can be dealt with. The precaution then mentioned should also be adopted in the case of trees sprayed with kerosene emulsion.

Crude Oil Emulsion.

A crude oil emulsion may be prepared in exactly the same manner as kerosene emulsion except that crude oil is substituted for the kerosene.

The stock solution in this case is diluted by the addition of one part of the stock solution to seven parts of water. This spray has been used against caterpillars in army-worm outbreaks, and for such a purpose it is of value on dairy farms or other grazing holdings on which the owner desires to use a non-arsenical insecticide. The above ground portions of plants with which this spray makes contact are killed together with the insects.

Tar Distillate Washes.

Proprietary tar distillate washes are now employed for the control of a number of pests, and for certain purposes they are quite effective. Their use, however, has to be confined to seasons of the year when the treated trees are completely dormant, and they are employed only in deciduous fruit orchards. They should be applied before the buds begin to swell, otherwise severe injury may be inflicted.

Tar distillate washes can be profitably employed to kill the over-wintering eggs of the green peach aphis. They are also used against San José scale and they can be of assistance in black peach aphis control.

Soap and Washing Soda Mixture.

A soap and washing soda spray has been found very effective for the control of the pink wax scale, for which purpose it has largely displaced the old washing soda wash. The latter spray was sometimes slightly drastic in its effect on treated trees, hence its waning popularity.

The spray is prepared by dissolving twenty-four cakes of Sunlight soap, or an equivalent quantity of similar soap, and 12-14 lb. of clean, fresh washing soda in 75 gallons of water. The washing soda is dissolved in a small quantity of the water which is brought to the boil and the soap, which should be shredded, is then added. The mixture is further heated until the soap has dissolved and is added to the balance of the 75 gallons of water, the spray being agitated during application.

Washing Soda Wash.

Washing soda wash is prepared by dissolving 1½ lb. of clean fresh washing soda in 4 gallons of water. This spray may be used for the control of white wax on citrus against which the soap and washing soda mixture is not so effective. As already indicated, however, the effect of the washing soda wash on the treated trees may be rather severe.

Derris and Cubé.

Insecticides prepared from certain species of Malayan plants belonging to the genus Derris have recently come into favour. These plants are well known as a source of fish poison both in Malaya and in the South Seas, and it has now been demonstrated that several active principles, including rotenone, which are present in derris, are highly toxic to some species of insects. The derris insecticides act both as contact sprays or dusts and as stomach poisons, and they possess the great merit of being safe for application to edible portions of plants due for harvesting at an early date. Insecticides of this type have given good results against the common cabbage caterpillar, the onion thrips, and various species of aphids.

Cubé is the name applied to a group of South American fish poison plants which have also been found to contain these active

principles. They are now a source of insecticides similar to those obtained from the genus Derris.

The derris and cubé insecticides are generally marketed as proprietary lines and the firms selling the various brands usually supply full details as to the strength of application.

Pyrethrum.

Pyrethrum powder, derived mainly from the flower heads of species of Chrysanthemum was formerly used for the control of insects such as the banana rust thrips. Deterioration on exposure and variability in results led to loss of popularity, some measure of which, however, has been restored by its demonstrated value against the red-shouldered leaf beetle.

Recently, standardised extracts have been manufactured, thus eliminating the objectionable feature just mentioned, and extracts of pyrethrum are now used very extensively in the manufacture of fly sprays.

A home-made pyrethrum spray may be prepared by mixing ½ lb. of pyrethrum in 1 gallon of kerosene, the mixture being agitated every now and again during a period of two hours. It is then allowed to settle and the clear liquid is drawn off and used as a fly spray. If water-white kerosene is employed in its preparation this spray can be used in furnished rooms. Stocks of this insecticide should be stored in tightly closed containers.

Lime Sulphur.

Lime sulphur is an excellent dual purpose spray, being a valuable insecticide and an efficient fungicide. It was formerly prepared on the orchard by boiling a mixture of sulphur, lime, and water, but the home-made preparation has largely been displaced by the commercial product which is obtained in concentrated form ready for dilution.

The insecticidal value of lime sulphur is largely dependent on the polysulphide content, a factor capable of determination only by analysis. The old method of discussing the strength of the solution and the effectiveness of lime sulphur in terms of the Baumé hydrometer reading is now generally regarded as unreliable.

Although lime sulphur is a useful insecticide against certain insects, it is more important as a fungicide. For this reason a much fuller account of the method of preparation and dilution of this material is given in the article dealing with fungicides appearing in this issue of the "Agricultural Journal," and to this the reader is referred.

Lime sulphur may be used on citrus at strengths varying between 1 in 10 (2·12 polysulphide) and 1 in 35 (0·61 polysulphide), the stronger sprays being used in the colder months. Lime sulphur is effective against Maori mite and white louse, both important pests of citrus, and it is also used for the control of San José scale on deciduous fruits in the Stanthorpe district, being there applied at a strength of 1 in 10 (2·12 polysulphide) during the winter months when the trees are dormant.

A combination spray of lime sulphur and arsenate of lead and a combination of lime sulphur and oil have been discussed in earlier paragraphs, and the precautions necessary in preparing and applying such combinations have been adequately indicated. Lime sulphur is also sometimes combined with nicotine sulphate to control certain

fungous diseases and soft bodied insects by a single treatment. When such a combination is employed the soap, which is included in the ordinary nicotine sulphate spray, should be omitted because it reacts with lime sulphur. No activator, however, requires to be substituted for the soap because the lime sulphur itself performs that function.

The discussion on oil sprays includes a reference to the period that should elapse between the application of a lime sulphur spray and an oil spray. Lime sulphur following Bordeaux mixture at a brief interval may produce a dark stain on the sprayed surfaces.

Sulphur.

Sulphur is used to control certain pests and diseases, the pests against which it is generally employed being red spiders and other mites.

This insecticide may be obtained in the form of flowers of sulphur or sublimed sulphur, which is produced by the condensation of sulphur vapour. It is also procurable in the form of ground sulphur, which is now available in the degree of fineness essential for application as an insecticidal dust. All ground sulphurs, however, do not necessarily possess the requisite degree of fineness, and this essential should always be specified when ordering this or any other type of sulphur for dusting purposes. Ground sulphur is prepared by grinding lump sulphur, and it should be noted that the grinding imparts a lighter yellow colour than is present in flowers of sulphur. The ground sulphur sometimes tends to become lumpy, while small but injurious quantities of free sulphuric acid may be present in flowers of sulphur.

Hydrated lime may be added to sulphur to the extent of one-third of the sulphur, thereby promoting adherence to the treated foliage, and ease of application while at the same time counteracting the possible presence of injurious quantities of free sulphuric acid.

The attention of the reader is directed to a reference in the discussion on oil sprays to the period that should be allowed to elapse between the application of a sulphur dust and an oil spray.

Sulphur dusting is usually carried out early in the morning when the dew is still present on the foliage, and should not be undertaken on windy days. Sulphur dust is also applied in citrus orchards in the early evening, after sundown, when the dew is falling.

Sulphur may be used as a fumigant for stored products, the sulphur on being burned, combining with the oxygen of the air to form sulphur dioxide. Sulphur may thus be employed for the control of cheese mites.

Colloidal sulphur is another form of this valuable insecticide which has recently come into prominence. The particles in this case are extremely small and the colloidal sulphur mixes readily with water.

Nicotine Sulphate and Nicotine.

Nicotine sulphate has long enjoyed popularity as an effective spray for soft-bodied insects such as aphids and thrips. It acts as a fumigant, and is one of the safest sprays to apply in so far as its effects on the sprayed plants are concerned. Nicotine is liberated relatively slowly from nicotine sulphate under normal conditions, hence in preparing a nicotine sulphate spray it is usual to add a substance as an activator which will

release the essential toxic principle in the spray—namely, the nicotine. For this purpose soap is usually incorporated in a nicotine sulphate spray, a standard formula being nicotine sulphate (40 per cent.) ½ pint, soap 2lb. and water 50 gallons.

Three combination sprays in which nicotine sulphate is combined with arsenate of lead, an oil spray, and lime sulphur, respectively, have already been discussed in earlier paragraphs. Nicotine sulphate may also be combined with Bordeaux mixture in cases where the grower desires to control certain fungous diseases and soft-bodied insects by one and the same spray application. Nicotine sulphate requires no activator in this combination, the Bordeaux mixture supplying all that is required in that respect.

Nicotine sulphate dusts are now largely employed instead of the spray, the nicotine sulphate being mixed with a fine powder which acts as a carrier and also usually functions as an activator to liberate the toxic nicotine from the nicotine sulphate. A good nicotine sulphate dust should be free from lumps, and when discharged from a duster the resultant cloud should float lightly in the air.

A more recent tendency has been to employ nicotine instead of nicotine sulphate in preparing these dusts, a material advantage being that a much more rapid volatilisation is obtained with the nicotine than is the case with nicotine sulphate dusts.

Nicotine and nicotine sulphate dusts deteriorate if exposed, and should accordingly be carefully stored in air-tight containers. Furthermore, it is desirable to purchase only sufficient dust to comfortably do the immediate work, thus leaving little or no surplus to deteriorate in storage.

The sprays are very useful against woolly apple aphis, and the dusts are the most satisfactory insecticide yet evolved for the control of banana rust thrips.

Home-made Tobacco Extracts.

Home-made tobacco extracts have long been out of favour as sources of nicotine sprays, preference now being given to nicotine sulphate sprays and nicotine sulphate or nicotine dusts prepared under carefully controlled conditions permitting standardisation at known strengths. The revival of tobacco growing, however, has created a considerable source of waste tobacco, and frequent inquiries are now received regarding the preparation of extracts from such waste material.

The tobacco plant varies considerably in its nicotine content, and the strength of a home-made extract must of necessity be subject to considerable variation. Some formulæ range from 1 lb. of waste tobacco to 1 gallon of water to 1 lb. of waste tobacco to 2½ gallons of water. It has been suggested that 1 oz. of washing soda be added to each 6 gallons of water.

In preparing the extract by cold soaking, the mixture is left standing for a period of 24 to 48 hours with occasional stirring; the fluid is then drained from the tobacco, and after straining is ready for application as a spray.

The extract may alternatively be prepared by heating the ingredients in a covered container over a fire. Heating continues until the mixture is on the point of boiling, when it is removed from the fire. After cooling the fluid is drained off, strained, and is then ready for use.

These tobacco extracts should be used straight away as they deteriorate on storing. Soap may be added as in the case of proprietary nicotine sulphate sprays.

Wetting, Spreading, and Sticking Properties of Spray Fluids.

As mentioned in an earlier paragraph, the successful application of insecticides depends on their ability to destroy the insect with safety to the treated plant at a cost that can be borne by the product to be marketed.

Success in spraying is, therefore, in large measure dependent on the ability of the operator to obtain a maximum degree of efficiency with a minimum expenditure of spray fluid. This desirable objective will be achieved only when the sprayed surface of the plant or insect is thoroughly, intimately, and evenly covered with a thin film of the spray fluid. In addition, the toxic element of the spray should remain on the sprayed surface for a sufficient period of time to achieve the objective for which it was applied.

Some spray fluids do not in themselves possess satisfactory wetting and spreading properties no matter what plant they are applied to, while such plants as the cabbage and certain insects—*e.g.*, mealy bugs—present decided difficulties in spray application. Nicotine sulphate with soap as an activator and oil sprays require no spreader, but the addition of such a supplementary substance is necessary in the case of arsenate of lead. A lime sulphur spray is also much improved by the addition of a spreader.

Where it has been found impracticable to obtain the desired degree of efficiency in the application of the spray fluid, it has become the practice to add supplementary substances variously known as wetters or spreaders and stickers.

The power of a supplementary substance to wet a surface may depend on its ability to produce chemical changes thereon—*e.g.*, a solvent effect may be produced on the waxy coating of the cabbage leaf or mealy bug. In addition, the wetting power is largely dependent on the physical interactions between the spray fluid and the sprayed surface. From a practical point of view the objective, however, of the supplementary substance is to ensure thorough wetting—*i.e.*, intimate contact between the spray fluid and the sprayed surface.

A further essential in the supplementary substance is its ability to ensure that the sprayed surface is completely covered with a film of spray fluid. The achievement of such an objective means that the spray fluid will not become aggregated in droplets, a development which would leave much of the surface unprotected or many of the insects untreated.

Wetting and spreading are not just one and the same thing, but any one of the commonly used supplementary substances will produce both effects in a spray fluid that is deficient in wetting and spreading properties, and it is generally referred to as a spreader. Soap, saponin, gelatine, and calcium caseinate have been used as spreaders, but before adding a spreader to a spray fluid the operator should satisfy himself that the addition can be made without reducing the toxicity of the spray or rendering the spray fluid more liable to injure the sprayed plants—*e.g.*, soap should not be used as a spreader for arsenate of lead.

Stickers, as their name suggests, are supplementary substances, the addition of which to the spray fluid increases the ability of the toxic substance to adhere to the sprayed surface. Actually the spreader added to a spray fluid functions also as a sticker. While the threefold purpose of a supplementary substance has been outlined so that the reader may appreciate the purpose of the addition, he need concern himself only with the use of one satisfactory agent of this type.

Recently a number of proprietary spreaders have been placed on the market by reputable firms backed in one instance by the claim that the material is "compatible with practically every spraying fluid."

Paradichlorobenzene.

The white crystalline substance known as paradichlorobenzene is now extensively used in Queensland, being employed mainly as a soil fumigant for the control of white grubs in sugar-cane plantations. It can also be used in the control of white ants attacking the roots of trees, and it fills a useful minor role in bookcases for the protection of the books from the ubiquitous cockroaches. It evaporates, rather after the manner of flake naphthalene, to a fumigant gas with a characteristic somewhat sweetish odour. When employed as a soil fumigant paradichlorobenzene should be applied when the soil is in a friable moderately moist condition and not when it is either excessively wet or dry.

Carbon Bisulphide.

Carbon bisulphide is extensively used for the fumigation of insect-infested seeds, cereals, and potatoes, and is also employed for the destruction of ants' nests, being a very satisfactory insecticide for both purposes.

This chemical rapidly evaporates on exposure to the air and forms a highly explosive and inflammable gas. Farmers using it should accordingly make certain that it does not come into contact with a flame or highly-heated pipes. Furthermore, it is essential to refrain from smoking when using carbon bisulphide, and the containers in which it is supplied should not be exposed to strong sunlight. The operator should also make every effort to avoid inhaling quantities of the gas, for serious consequences will ensue if this precaution is not observed.

Satisfactory results with carbon bisulphide fumigation are obtainable only when certain temperatures prevail, and it is generally considered that a temperature of at least 70°F. is desirable. It has been demonstrated that fumigation at less than 60°F. has been productive of disappointing results. For this reason fumigation should not be undertaken in cold weather, and it should start in the morning, so as to obtain the benefit of the higher day temperatures.

The seed to be treated for insect infestation is placed in a suitable container, which should be as air-tight as possible. The carbon bisulphide is then poured into saucers or other suitable dishes placed on top of the seed so that the gas, which is heavier than air, will diffuse throughout the container, which should be immediately tightly closed.

The general practice is to allow 4 or 5 lb. of the carbon bisulphide to each 1,000 cubic feet of the container, and to leave the seed exposed to the gas for thirty-six hours. Cowpea and allied seed, however, should be fumigated for twenty-four hours only. The fumigated seed should

then be aired to remove the gas. The germination of mature seed is not affected if dry when treated and if the precaution of airing the seed after treatment is observed.

Reinfestation of fumigated seed will take place if steps are not taken to prevent it, hence the usual procedure is to store the treated seed in tightly closed containers giving little chance of reinfestation.

Cereals and potatoes are fumigated in a rather similar manner except that, in the case of the latter, the weaker dosage of carbon bisulphide is used.

Hydrocyanic Acid Gas.

Another extremely useful fumigant is hydrocyanic acid gas, which is extensively employed for the fumigation of ships, buildings, imported raw materials, dormant nursery stock, and citrus orchards.

This colourless gas is lighter than air and diffuses rapidly, a smell of bitter almonds being the only means whereby its presence can be readily detected. It is extremely poisonous to insects, animals, and man, and must therefore be handled with great care. It is a highly-efficient insecticide for the fumigation of scale-infested citrus trees, and produces no appreciable injury in such trees if the requisite precautions are observed in its application.

The discussion of hydrocyanic acid gas fumigation will be confined to its application to insect-infested citrus orchards, and the first point to note in connection therewith is the fact that the gas may be effectively generated in any one of several ways.

The method originally employed is still frequently used in Queensland, and is known as the pot system, in which the gas is generated under a sheet by the interaction of potassium cyanide, sulphuric acid, and water. The tree to be fumigated is completely enclosed by pulling a sheet over it by means of poles not less than 18 feet in length for average size trees. The poles should, in general, be about 2 feet longer than the height of the trees to be fumigated. The height and diameter of the enclosed space are then obtained by comparison with a pole plainly marked in feet, and by reference to Table I. the operator ascertains the quantity of materials required for the fumigation of the tree he has just covered and measured. The requisite quantities of these materials are accurately weighed or measured, and the water is poured into an earthenware jar. The sulphuric acid is then carefully and slowly added to the water, and the jar is placed under the fumigating sheet covering the tree. The potassium cyanide is immediately dropped into the mixture of water and sulphuric acid, and the portion of the sheet that has been raised to permit the charging of the pot is promptly closed. A word of warning must be issued with respect to the addition of the sulphuric acid to the water, because if care is not exercised in doing so some of the acid may splash on to the operator and inflict very severe burns.

The proportion of water, sulphuric acid, and potassium cyanide is 3:1:1, the amount of water and sulphuric acid being expressed in fluid ounces and the potassium cyanide in ounces avoirdupois. It is desirable at this stage to mention the fact that the so-called potassium cyanide is generally a mixture of potassium cyanide, sodium cyanide, and a little inert matter. However, its equivalent value in pure potassium cyanide has to be declared on the labels. The requisite amounts of potassium cyanide necessary for the fumigation of various sizes of citrus trees

TABLE I.

POTASSIUM CYANIDE.

45 Minutes Exposure.

Diameter of Tree (feet).

Height of Tree (feet).	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
4	1	1	1	1																4
5	1	1	1	1½	2															5
6		1½	1½	2	2	2½	3	4	4											6
7		1½	1½	2	2½	3	4	4	4	5										7
8				2½	3	3	4	4	5	6	6	6	7							8
9				2½	3	3	4	4	5	5	6	6	7	7						9
10				3	3	4	4	4	5	5	6	6	7	8	9					10
11					4	5	5	5	6	6	7	7	8	9	10					11
12						5	5	6	6	6	7	8	8	10	11	12	13	15	17	12
13						6	6	7	7	7	8	9	9	12	13	14	15	16	18	13
14							6	7	7	8	9	10	11	13	14	15	17	18	18	14
15								7	8	8	10	11	12	14	14	16	18	20	20	15
16									9	10	12	12	13	14	15	17	18	20	21	16
17										12	13	13	14	15	16	18	20	22	22	17
18											13	13	15	16	18	20	22	23	24	18
19												15	16	18	19	21	23	25	25	19
20													17	19	21	23	24	25	26	20
21													19	19	21	23	25	26	27	21
22														21	22	24	25	26	27	22
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Doses in Ounces.

Proportion: Water, 3; Sulphuric Acid, 1; Potassium Cyanide, 1.

are shown in Table I. Once the requisite quantity of potassium cyanide is known for any particular tree, the quantities of sulphuric acid and water required in the fumigation of that tree are readily ascertainable according to the proportion mentioned earlier in this paragraph.

The duration of the fumigation is generally forty-five minutes, at the end of which period the sheet or tent is transferred to the next tree. The materials used for tents and their handling and measurement are discussed later in these notes on hydrocyanic acid gas.

TABLE II.

CYANOGAS DUST.

45 Minutes Exposure.

Diameter of Tree (feet).

Height of Tree (feet).	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
4	1	1	1	1½																4
5	1	1	1½	1½																5
6	1	1½	1½	1½	2	2½	3	4	4											6
7	1	1½	1½	2	2½	2½	3½	4	5	5½										7
8		1½	1½	2	2½	3	4	4½	5½	6½	7½	8½	10							8
9			2	2½	2½	4	4½	5	6	7	8½	9½	11	12½						9
10				2½	3	4	4½	6	7	8	9½	10½	12	14	15½					10
11					3½	4½	5	6½	7½	9	10	12	13½	15	17	19				11
12					3½	4½	6	7	8	10	11	13	14½	16½	18½	20½	23	25	27½	12
13							6	7½	9	10½	12	14	16	18	20	22	24½	27	30	13
14							7	8	9½	11	13	15	17	19	21½	24	26½	29	32	14
15								8½	10	12	14	16	18	20½	23	25½	28½	31	34	15
16								9	11	13	15	17	19½	22	24½	27½	30½	33½	36½	16
17									11½	13½	16	18	20½	23	26	29	32	35½	39	17
18									12½	14½	17	19	22	24½	27½	31	34	37½	41	18
19									13	15½	18	20½	23	25	29	32½	36	39½	43½	19
20									13½	16	18½	21½	24½	27½	30½	34	38	42	46	20
21												22½	25½	29	32½	36	39½	44	48	21
22												23½	26½	30	34	37½	41½	46	50½	22
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Doses in Ounces.

Table recommended by manufacturer. Modifications may be made in this table by the manufacturer, and citrus growers should accordingly obtain the latest table when purchasing their supplies of this fumigant.

Fumigation by the pot method, which can be carried out only during the night, necessitates the handling of a very corrosive acid and a highly poisonous chemical. Hence the pot system is by no means an ideal one, and it has recently been largely displaced by other methods of generating the gas.

TABLE III.

CALCID BRIQUETTES.

40 Minutes Exposure.

Diameter of Tree (feet).

Height of Tree (feet).	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
4	1	1	1½	1½																4
5	1	1	1½	2																5
6	1	1½	1½	2	2½	2½	3	3½	4											6
7	1	1½	2	2	2½	3	3½	4	4½	5										7
8		1½	2	2½	2½	3	3½	4½	5	5½	5½	6	7							8
9			2	2½	3	3½	4	5	5½	5½	6	7	8	9						9
10				2½	3	3½	4½	5	5	6	7	8	9	10	11					10
11					3½	4	4½	5	6	7	8	9	10	11	12	13				11
12					3½	4	5	5	6	7	8	10	11	12	13	14	16	17	19	12
13							6	6	6	7	9	10	11	13	14	16	18	20	22	13
14							6	6	7	8	9	11	12	14	16	17	19	21	23	14
15								6	7	8	10	11	13	15	17	19	21	23	25	15
16								7	8	9	11	12	14	16	18	20	22	24	27	16
17									8	10	11	13	15	17	19	21	24	26	29	17
18									9	10	12	14	16	18	20	22	25	28	30	18
19									10	11	13	15	17	19	21	24	26	29	32	19
20									10	11	13	15	18	20	22	25	28	31	34	20
21												16	19	21	24	26	29	32	35	21
22												17	19	22	25	28	31	34	37	22
	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	

Doses in Number of Briquettes.

Table recommended by manufacturer. Modifications may be made in this table by the manufacturer, and citrus growers should accordingly obtain the latest table when purchasing their supplies of this fumigant.

The most generally used alternative to the pot system is the generation of the gas by the use of calcium cyanide, which is obtainable in Queensland in the form of Cyanogas and Calcid Briquettes. The calcium cyanide in a finely divided condition interacts with the water

vapour in the atmosphere, and hydrocyanic acid gas is evolved. In practice, the Cyanogas "A" dust, which is the form of Cyanogas generally employed in this State, is blown under the sheet by means of a forge type blower, although some growers, in order to obviate the cost of the blower, place the necessary amount of dust in a saucer and throw it under the sheet, using a sweeping motion in order to obtain a good distribution of the dust. Application by the special blower is to be preferred to the use of the saucer. A special machine grinds the Calcid Briquettes and blows the resultant powder under the sheet.

The number of ounces of Cyanogas dust and the number of Calcid Briquettes required for the fumigation of various sizes of citrus trees will be found in Tables II. and III., respectively.

Fumigation by means of calcium cyanide possesses many advantages over the old pot system, the principal of which are the simplicity of the operation, the elimination of the highly-corrosive sulphuric acid, the fact that calcium cyanide, although itself a very strong poison, is safer to handle than potassium cyanide, the fact that the fumigation can be done in the day time under widely varying climatic conditions, and the further fact that calcium cyanide is more effective for most purposes on a citrus orchard.

Liquid hydrocyanic acid gas has also been employed elsewhere as a substitute for the pot system, but it has not been used in Queensland.

Fumigation can be effectively carried out without any appreciable undesirable consequences to the fumigated trees, but to ensure safe and successful treatment certain precautions must be observed.

The dimensions of the tree must be correctly ascertained, the appropriate quantity of chemical or chemicals and water definitely determined, and then accurately measured out. Trees should not be fumigated when wet, and if the work is being carried out at night the incidence of a heavy dew renders the continuance of fumigation undesirable. Furthermore, wet sheets should not be used in fumigation.

Fumigation by the pot system is inadvisable when the temperature exceeds 75° F. on the coast or 80° F. in inland citrus areas. With calcium cyanide, however, the safe temperatures are generally 10°F. to 15°F. higher when normally healthy trees are being fumigated under average good conditions. However, special care should be exercised when fumigating near the temperature limit of safety, and on hot summer days operations should cease between 12.30 p.m. and 3 p.m.

Trees on soil that is very wet, either as a result of rain or irrigation, should not be fumigated, but, on the other hand, drought-stricken trees are more susceptible to injury than those enjoying normal moisture conditions. Fumigation may cause excessive injury to trees carrying a large amount of tender young growth, and in such cases treatment should be delayed as long as is practicable. Young fruit is also susceptible to injury, and trees bearing fruit of a smaller diameter than three-quarters of an inch should not be fumigated. Finally, growers should remember that trees with a Bordeaux mixture residue may be very seriously injured by fumigation. Hence a tree that has been sprayed with Bordeaux mixture should not be fumigated until at least six months have elapsed, and, indeed, nine or twelve months is a safer interval. Reference has been made in an earlier paragraph to the interval that should elapse between fumigation and the application of an oil spray, and the reader's attention is directed thereto.

Before leaving the subject of fumigation, some mention must be made of the tent equipment required for the purpose. The tents or sheets are usually made of duck or drill, and must be sufficiently closely-woven to prevent the rapid escape of the gas and to stand the rough usage to which they will be subjected without being unduly heavy. It is generally considered that 8-oz. army duck is better than drill and is the best material than can be employed. Recent departmental experiments, however, have shown that a medium-weight, closely-woven calico gives satisfactory results. It is considerably cheaper than duck, but its life would not be so long. The sheets are usually eight-sided, and their diameter varies from 30 to as much as 80 feet, depending on the size of the trees to be covered. A well-shaped tree 12 feet in height can usually be covered by a 36-foot sheet.

BOTFLIES IN HORSES.

At about this time of the year all horses should be drenched for bots. In determining the period of the year when drenching for these parasites will give best results, their life history must be taken into consideration.

The adult flies occur throughout the late spring and summer. During this time they lay their eggs upon the hairs of certain parts of the horse's body. These eggs hatch in time and the young larvæ or bots enter the mouth of the horse. Here they remain for a certain period in the tissue of the tongue and cheeks. They eventually reach the stomach where they are to be found throughout the winter. During the late winter and spring they leave the stomach and are passed out with the dung. After a resting stage in the ground, the larvæ are gradually transformed into adult flies which eventually emerge and commence to lay eggs.

If the horse is drenched during the spring and summer, it may therefore readily become reinfested. Adult flies may still be prevalent and many eggs are yet to hatch; and there may be larvæ in the tissues of the cheeks and tongue which are protected from the drug. In the late autumn, however, all larvæ are in the stomach and are easily killed and removed by treatment.

To be most effective, all horses not only on the one farm but on every farm in a district should be treated at this time of the year.

The most effective drug is carbondi-sulphide. The animals are starved for twenty-four hours before and for four hours after treatment. The drug is enclosed in a gelatine capsule and given as a ball at the rate of 6 cubic centimetres for every 250 lb. weight. Care should be taken not to allow this ball to break in the mouth as its effects may end fatally for the horse. If such an accident should happen, wash the mouth out at once with clean rain water.

—Dr. F. H. S. Roberts.

Fungicides.*

J. H. SIMMONDS, M.Sc., Senior Research Officer.

THE term fungicide usually refers to an agent of a chemical nature employed to control a fungous disease. It is usually applied as a spray or dust so as to give a protective covering over the whole plant. Spraying is seldom resorted to for the control of physiological and virus diseases, although in the former case a few diseases which are due to a lack of certain chemicals in the plant's food supply can be remedied by applying this chemical in the form of a spray. Thus, citrus exanthema is cured by applying copper salts to the tree and iron chlorosis of the pineapple by spraying the crop with iron sulphate. Virus diseases are sometimes kept in check and prevented from spreading by spraying with an insecticide which controls the insect vector. Spraying has no effect on the virus within the plant and, once infected, a plant cannot be cured of a virus disease by this means.

It must be remembered that the application of a fungicide should not be relied upon as the sole means of keeping diseases in check. Much can be done by employing cultural methods which ensure strong vigorous growth and by avoiding unsuitable or badly drained soil. Attention to sanitation is also important. The remains of a diseased crop should be removed and burnt as soon as possible and when a disease is known to be present it is advisable not to grow the same or allied crops successively on the same land. Where possible resistant varieties should be sown. These and suchlike precautions should become part of the normal routine of the farm.

TYPES AND METHODS OF APPLICATION.

The control of plant diseases by means of fungicides depends on the fact that it is possible to obtain certain chemicals which will kill the fungus or bacterial parasite on the surface without causing injury to the plant itself. This condition is not an easy one to satisfy—hence it is found that the range of fungicides in use at the present day is comparatively limited. The common ones have as their active constituents one or other of the two elements—sulphur or copper, and may therefore be classed as belonging to either a sulphur group or a copper group. Speaking generally, each of these groups has its special use, which it is important for the grower to note.

The sulphur fungicides are used mainly against the ectoparasites, such as the powdery mildews, and for the control of the rust fungi. They are also required as a summer spray for certain stone fruit trees, such as the plum and peach, whose foliage would be injured by a copper spray at this time of the year.

The copper fungicides are usually favoured for the control of the non-superficial type of plant parasite, owing to the toxic action which they have on the germinating spore, and also to the fact that they possess greater permanency. When properly used the copper sprays will not injure the plant, nor are they sufficiently poisonous to human beings to render their preparation and proper use objectionable.

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Fungicides are used either in the form of a liquid or dust. If a wet spray is used, it should be applied at a high pressure by means of a satisfactory type of pump. This will result in a more thorough distribution of the spray on the plant and a quicker operation. A barrel pump delivering the spray at about 200-lb. pressure is a suitable outfit for most purposes. The knapsack spray is not economical except for small areas, or when initial cost is a serious consideration.

Dusting, in so far as the use of sulphur is concerned, has been in vogue for many years, and sulphur applied as a dust is usually effective for the use to which it is put. The application of copper fungicides in the form of a dust has come into practice comparatively recently. This method has the advantage over spraying in the ease and rapidity with which a dust may be applied. There are, however, certain disadvantages. The results obtained from dusting are not always equal to those obtained with a wet spray. To obtain satisfactory covering, it is essential to dust when the air is still, and if the surface of the plant is shiny, moisture should be present to ensure adherence. These are conditions often lacking when required. A dust does not remain on a plant as long as a spray, with the result that more applications are needed, and consequently the cost is somewhat greater. Careful consideration has, therefore, to be given to the merits and demerits of each particular case before deciding on the best form in which to apply the fungicide.

Spreaders.

To be satisfactory a spray must completely cover and wet the surface of the plant which it is to protect. For this reason it is often necessary to add a spreader. The function of the spreader is to lower the surface tension of the spray so that the drops of liquid flatten out and form a complete and uniform film over the surface. This results in a more complete protection, and in less unsightly stain. A number of different substances are available for this purpose. The choice is based on several considerations, such as cost and availability, efficiency with the particular spray to be used, and the avoidance of combinations which might bring about harmful reactions between chemical constituents of spray and spreader. Several of the more common spreaders are discussed in connection with the preparation of Bordeaux mixture and other sprays.

Hints for Spraying.

The following hints may be of some help to those who have not had much experience in the application of fungicides:—

(1) Take care of the spraying machine. See that the pump will deliver a fine spray at a satisfactory pressure.

(2) Always use a strainer in the spray tank and clean out the pump and nozzle well after use as this will help prevent stoppages during operation.

(3) Do not mix a spray in a rough and ready manner. Weigh out the materials carefully.

(4) Do not wait until a disease becomes well established before applying a fungicide. It is then usually a waste of time and material to attempt remedial measures.

(5) In general, it is necessary to spray thoroughly and sufficiently often to keep the plant surfaces, both upper and lower, covered with a film of spray during the whole of the susceptible period.

(6) The crop should be well protected during moist weather, as at such times most fungous diseases spread rapidly, the conditions being suited to both spore production and germination. Hot, dry days usually serve as a check to disease for the opposite reason.

(7) If possible avoid spraying on exceptionally hot days or when the plants are in a wilted or weakened condition as some spray injury may result.

The number of different specifics which have been advocated from time to time for the control of various plant diseases is considerable. Of these some have a wider scope and have stood the test of long usage. Details of the preparation of the more useful of these are given below. Of recent years a number of new fungicides have been suggested for use in the control of certain diseases. In most cases it is too early to be able to predict how effective these substances will be under Queensland conditions, but it is advisable to keep in touch with any developments along these lines.

BORDEAUX MIXTURE.

Bordeaux mixture is probably the most widely used fungicide at the present day. It consists of a somewhat indefinite mixture of copper compounds which are precipitated in a fine gelatinous suspension when a solution of bluestone (copper sulphate) is mixed with one of lime (calcium hydroxide). The method of preparation ensures that the copper compounds are in an insoluble state and since they are not then absorbed into the tissues of the plant the spray is harmless to the crop.

This spray exerts its fundicidal action by reason of the fact that on the surface of the plant minute quantities of copper are dissolved out of the spray film by secretions from the host cells, the fungus hyphae and by other means, and this is sufficiently poisonous to destroy the spores or germ tubes of the fungus parasite without harming the plant itself.

Briefly, the preparation of the spray, using one of the commonly accepted formulæ, is as follows:—

1. Dissolve 4 lb. bluestone in 20 gallons of water in a wooden cask.
2. Slake 4 lb. burnt lime with a small quantity of water and add the paste formed to 20 gallons of water in a second vessel.
3. Stir the two solutions and pour them simultaneously through a strainer into a third vessel or the spraying tank.
4. Test the mixture for acidity.

Formulæ.

Mixing the spray with suitable proportions of bluestone and lime ensures that practically all of the copper is converted into the insoluble form. On the other hand, should there be insufficient lime to precipate all the bluestone, the copper salts remaining in solution may be absorbed by the plant in sufficient quantity to cause injury.

The proportions of bluestone and lime recommended for preparing Bordeaux mixture vary considerably with the circumstances. Generally speaking, even when using a pure sample of burnt lime, the weight of this must be at least one-quarter the weight of copper sulphate, as otherwise some of the copper may still remain free in solution and cause burning. In practice, in order to avoid this risk, the lime content is rarely less than two thirds that of the bluestone.

It is generally considered that the lower the lime content is below equality in weight with the bluestone the more rapid is the action of

the spray and the greater is the fungicidal activity since under these conditions the copper is more readily available. On the other hand, when equal quantities of lime and bluestone or a greater weight of lime than bluestone is used, the copper will be more insoluble, and the spray will therefore adhere longer and be less liable to injure tender plants. The greater the proportion of lime the greater will be the deposit left on the plant, and this may be an important consideration when fruit are to be sprayed. Also, an excessive amount of lime on its own account, is harmful to some plants.

When first used the ingredients of Bordeaux mixture were much more concentrated than at the present day, when the tendency is still towards weaker sprays with improvements in spreading and sticking qualities. The formulæ in the following table are amongst those commonly used:—

	Bluestone. lb.	Burnt Lime. lb.	Water. gal.
Maximum strength. Grape vines and deciduous fruit trees at bud burst	6	4	40
Normal strength. Tomato, potato, and most small crops	4	4	40
Citrus	3	2	40
Cucurbits	3	4	40
Pear, plum, and apricot foliage. Seedlings and plants subject to spray injury	2	3	40

It is common practice to refer to a spray containing 6 lb. bluestone, 4 lb. burnt lime, and 40 gallons of water, as a 6-4-40 mixture, the amounts of bluestone, lime and water always following in that order.

Materials.

Bluestone may be obtained in three forms—large crystals, smaller crystals known as bluestone fines, and powder. For the sake of ease in dissolving the fines are to be preferred. Powdered bluestone is more expensive, and therefore uneconomical to use.

The lime used may be in the form of burnt (quick) lime or hydrated lime.

Burnt lime possesses the disadvantage that it cannot always be obtained in a pure state and, moreover, if not kept in a tight container may become air-slaked, when its value for spray purposes is lost. The latter difficulty may be overcome by slaking the burnt lime when fresh and storing under water. For convenience when in use later, store a known amount in a known volume of water. It is then only necessary to make up any water that has evaporated, stir well, and take out the volume calculated to contain the required amount of lime.

Hydrated lime is obtained from burnt lime by slaking it with water under controlled conditions. It is more expensive, but as it has not the disadvantages of burnt lime, its use considerably simplifies the mixing of the Bordeaux. It must be noted that it takes one and one-third parts by weight of hydrated lime to be equivalent to one part of burnt lime It is usually found that the weaker nature of the hydrated lime is largely compensated for by its greater purity. Hence in formulæ containing a high proportion of lime such as the 4-4-40 mixture the same amount of hydrated lime as burnt lime may be used. In other cases it is necessary to use about one-third as much again of the hydrated as specified for the burnt lime. Do not confuse hydrated lime with burnt lime which has

become crumbled with contact with air, and is therefore air-slaked lime. This latter, although somewhat the same as the former in appearance, consists of a different compound, and is useless for the purpose of preparing Bordeaux mixture.

Details of Preparation.

Dissolve the bluestone in half the required amount of water in a wooden or copper vessel. To do this it is best to tie the bluestone in a piece of sacking and leave it suspended in the top of the water for a few hours or overnight. Only wooden, earthenware, or copper vessels can be used to contain bluestone solution, as this chemical will quickly eat through iron. Wooden casks form convenient receptacles, and for mixing small quantities a kerosene tin or iron drum well covered with tar or pitch may be used.

Slake the lime in another vessel by the gradual addition of small quantities of water, allowing the heat generated to aid the reaction. If using hydrated lime, form a thin paste in the same manner. Then add water to make up the remaining half of the total required.

Pour the two solutions, bluestone and lime, simultaneously through a fine strainer into a third container or the spraying vessel and stir well. This method gives a fine gelatinous precipitate which does not readily settle out. In case of necessity one dilute solution may be poured directly into the other or a fairly concentrated lime solution may be poured with constant agitation into the diluted bluestone containing the rest of the total water needed, without unduly altering the satisfactory nature of the resulting mixture. Two concentrated solutions must never be mixed before dilution, as the precipitate then tends to be of a granular formation and its spreading and adhesive properties are poor. For the same reason the two solutions should be quite cold before mixing. Much labour is saved by providing a convenient permanent mixing platform.

Testing for Acidity.

It sometimes happens that the lime used is of poor quality, and the finished spray may then contain a certain amount of free bluestone not precipitated. This must be corrected if spray injury is to be avoided. It is therefore always best to test the spray before using with blue litmus paper, small packets of which may be obtained from a chemist. Dip a strip of the paper into the layer of clear liquid on top of the spray. If the colour changes to red an excess of bluestone is present, and more lime must be added until the paper remains blue. A rough test is given by allowing a clean knife blade or bright iron nail to remain in the mixture for a few minutes. If, on removal, this shows a brown coating of copper, more lime is required.

Hints for Using Bordeaux Mixture.

(1) The spray should be used as soon as possible after preparation, as it loses its gelatinous nature after several hours standing and settles out.

(2) Do not apply a Bordeaux spray during showery weather, as some spray injury may follow.

(3) Spraying on an exceptionally hot day or when the plants are wilted or weakened by drought may also result in burning.

Stock Solutions.

It is sometimes found convenient to make up stock solutions of bluestone and lime. Dissolve 40 lb. of bluestone in 40 gallons of water in a wooden vessel. Slake 40 lb. of quicklime and add water to make up to 40 gallons. The solutions will keep well if protected from evaporation. One gallon of each will contain 1 lb. of bluestone or lime respectively. It is therefore only necessary to stir well and take out 1 gallon for every pound of lime or bluestone required. It is advisable to mark the height of the solution in the barrel each time some concentrate is removed in order that water may be added to this mark to make up for any loss by evaporation.

Proprietary Bordeaux Mixtures.

Certain proprietary mixtures, usually in the form of a paste or powder, are now on the market, which, it is claimed, will form Bordeaux mixture on addition of the required amount of water, thus doing away with the trouble of preparing the home-made article. Some of these ready prepared materials are mixtures of bluestone and lime with or without a spreader. Others are mixtures of bluestone and soda, and are therefore more akin to a Burgundy spray. There are, however, some disadvantages in the use of these mixtures—

(1) They are usually more expensive than the home-made spray.

(2) The exact composition varies with the different makes, and it is therefore sometimes difficult to prepare a mixture of definite strength.

(3) It is found that some of the ready-mixed powders do not give such a fine suspension as the home-made mixtures, so that their spreading and adhesive properties are poorer.

However, if a reliable brand is obtained, these mixtures serve a useful purpose for the treatment of a crop for which it is not desired to acquire the apparatus necessary for home mixing. Best results are obtained if the dilution is calculated on the actual copper content of the mixture, so that the final spray will contain the same amount of metallic copper as would a home-made Bordeaux of the correct strength. It is useful to remember that 1 lb. of metallic copper is contained in approximately 4 lb. of bluestone (crystalline copper sulphate), 3 lb. of dehydrated copper sulphate (monohydrate) and 2 lb. of copper carbonate (basic).

Combination Sprays.

Lead arsenate may be combined with Bordeaux mixture for combating both fungus diseases and chewing insects. The lead arsenate should be mixed to a cream with water and added to the prepared Bordeaux.

Nicotine sulphate may be added to Bordeaux mixture for the control of soft-bodied sucking insects. With this combination it is not necessary to add soap to liberate the nicotine.

Cyanide fumigation should not follow a Bordeaux spray until six months or longer have elapsed, otherwise there is risk of serious injury.

Lime sulphur applied shortly after a Bordeaux spray may leave a black stain on the sprayed plants.

The application of an oil spray prior to or following Bordeaux mixture may lead to injury under certain circumstances, and the notes on this subject in the article on insecticides appearing in this issue of the "Agricultural Journal" should be consulted.

Spreaders.

Properly made Bordeaux mixture when freshly prepared spreads sufficiently well on easily wetted surfaces to give a good cover. In certain circumstances, however, when the plant to be sprayed has a shiny or waxy surface, or needs special attention, it is an advantage to use a spreader. Several common substances as well as some excellent proprietary preparations are available for use.

Although discussed for convenience at this stage, many of the spreaders may be used to advantage with other sprays, and will be referred to in connection with them.

Soft Soap.—Use a genuine potash soft soap at the rate of 2 to 4 lb. to 40 gallons of spray. Dissolve the soap in a small portion of the original volume of water saved for the purpose using heat if necessary. Then pour into the main bulk of spray and stir well until a good lather is obtained.

Soap must not be used if the Bordeaux is to be combined with lead arsenate in a dual purpose spray.

Molasses.—Molasses may be stirred directly into the mixed spray, using it at the rate of 4 lb. to 40 gallons. A slight precipitate follows the addition of both molasses and soft soap to Bordeaux mixture, but apparently this has no detrimental effects on the spray.

Oil Emulsion.—The addition of an emulsified oil increases both the spreading and adhesive properties of a spray. Bordeaux and oil emulsion has been used as a spray for citrus. Beside acting as a spreader the oil is reported to reduce the amount of scale infestation which often follows the use of a Bordeaux spray. However, it is possible that colloidal copper will supersede Bordeaux and oil for use in this connection.

Take of a good brand of spraying oil an amount equal to 1 per cent. of the total volume of the spray (approximately ½ gallon spraying oil to 40 gallons spray). Emulsify this thoroughly in twice its own volume of water by shaking or stirring, or if a bucket pump is available by pumping it back into itself. Then stir well into the Bordeaux mixture. The oil should be well emulsified before adding to the Bordeaux.

Used with a higher percentage of oil this combination has been used as a dual purpose spray on certain deciduous fruit trees.

Casein.—Casein is a white powder derived from milk and in commercial spreaders is usually mixed with various proportions of lime to increase its solubility. A casein spreader does not appear to markedly improve the spreading properties of a good Bordeaux mixture. On the other hand when used with lime sulphur a decidedly better cover is obtained. It has been stated by some workers that the addition of casein renders a spray less permanent on the plant.

Proprietary Spreaders.—A number of proprietary spreaders of varying chemical composition are now on the market. One known as Agral is available locally. While these spreaders are usually more

expensive than the older materials, the good brands are decidedly more efficient and can be recommended for use with all sprays where the subject to be treated is difficult to wet or a particularly good cover is required.

BORDEAUX PAINT.

This mixture is often useful for painting pruning cuts, wounds, and other injuries to prevent the invasion of rot-producing fungi.

Mix 1 lb. of burnt lime or 1½ lb. hydrated lime in 1 quart of water. Dissolve ½ lb. of bluestone in another quart in a wooden, glass, or earthenware vessel. Mix equal quantities of the two solutions to give the amount of paint required. If a thicker mixture or paste is required reduce the amount of water.

BURGUNDY MIXTURE.

Burgundy mixture is very similar in fungicidal value to Bordeaux, and can be used as a substitute for the latter when good quick lime and hydrated lime are not available. Now that good quality hydrated lime is so easily obtained it is doubtful whether this spray possesses any advantage over Bordeaux.

Formula:—

Bluestone	6 lb.
Washing soda	8 lb.
Water	40 gallons.

This can be reduced when spraying is to be frequent to a 4-5½-40 formula. The preparation is essentially the same as in the case of Bordeaux, except that washing soda is used instead of lime.

The washing soda may contain impurities, and it is therefore necessary to test for excess bluestone as in the case of Bordeaux. Also, as excess soda, unlike lime, may cause injury in some instances, it is advisable to test the mixture with red as well as blue litmus paper. If the red paper quickly turns a definite blue too much soda has been used, and more bluestone solution should be stirred in slowly until there is a distinct but slow change to a blue colour.

Lead arsenate must not be added to Burgundy mixture. The same spreaders can be used as for Bordeaux.

AMMONIACAL COPPER CARBONATE.

As a fungicide this spray is definitely inferior to Bordeaux and Burgundy mixtures, but possesses the advantage that it can be used on fruit approaching maturity or on ornamental shrubs since it is a clear solution leaving no stain. Further work will probably demonstrate that colloidal copper can be substituted for this spray to advantage in many cases.

Formula:—

Copper carbonate	5 oz.
Strong ammonia	3 pints.
Water	40 gallons.

Make the carbonate of copper into a paste by the addition of a pint or two of water. Add the 3 pints of concentrated ammonia to about 2 gallons of water in order to make the solution easier to handle. Stir

the copper carbonate paste into the ammonia water until no more will go into solution. It is advisable to have a little excess copper carbonate left undissolved at this stage. Add water to make up to 40 gallons.

COLLOIDAL COPPER.

Home made colloidal copper has only recently been employed in Queensland, but already it has been shown to possess certain advantages in the control of blue mould of tobacco and as a citrus fungicide It possesses the advantage that a stock solution is prepared, and this can be stored and drawn upon when required for dilution with water and so provide spray for more than one application. Colloidal copper also leaves little stain and is therefore useful for applying to fruit that is approaching maturity. When used on citrus the possibility of increased scale infestation is less than with Bordeaux.

Formula for 1 gallon of Stock Solution.

A.	Bluestone	1 lb.
	Molasses	1 pint.
	Water	4 pints.
B.	Caustic soda	5 oz.
	Water	3 pints.

Preparation of Stock Solution.—A. Dissolve the bluestone in the required amount of water by suspending the crystals in a piece of sacking in the top of the liquid. Some little time is required for this process. Next add the moasses, stirring well. Use a wooden, copper, or non-metallic vessel to hold the bluestone solution since this chemical will eat through iron. Tin vessels thoroughly coated with pitch will last temporarily. B. In a second vessel carefully dissolve the caustic soda in the water required for it.

The solution of bluestone and molasses (A) is next made slightly alkaline by adding to it the caustic soda solution (B) very slowly and with constant stirring.

The stock solution should be stored in some non-metallic container such as a closed wooden barrel, where it will remain in a good condition for from two to three months. It should not be used until it is at least a week old, when the colour will have changed from green to slightly yellow.

Dilution for Spraying.—Owing to the short time that colloidal copper has been in use in this State, the various strengths at which to use the spray have not been fully worked out. The recommendations given here are therefore of a provisional nature. Before removing part of the stock solution replace any water evaporated and stir vigorously.

For seedlings ..	3 pints stock solution to 10 gallons water
As a general spray ..	3 gallons stock solution to 40 gallons water

Spreaders.—Genuine potash soft soap at the rate of 2 lb. to 40 gallons may be added as a spreader. The soap should be dissolved separately in a small portion of the water retained for the purpose and heated if necessary. It is then added to the rest of the spray, and the whole briskly stirred, or, better still, the spray is pumped back into itself until a good froth is obtained. The proprietary spreaders mentioned for use with Bordeaux mixture may also be used with this spray.

LIME SULPHUR.

As has been pointed out in the discussion on page 604 sulphur compounds are used mainly for the destruction of the powdery mildews and the rust fungi. Of the different forms in which sulphur is used lime sulphur is probably the most important. It is the usual experience that this spray is more effective than sulphur dust or the common sulphur-water mixtures. Colloidal sulphur, however, on account of its extremely fine state of division, may prove a suitable substitute for lime sulphur in some instances. Lime sulphur is not usually as efficient as Bordeaux mixture for the numerous diseases in which the parasite has an internal existence. Weighing against this disadvantage is the fact that lime sulphur has considerable insecticidal value in the destruction of scale and mites. It can also be used as a summer spray for certain deciduous fruit trees which would be injured by Bordeaux.

Lime sulphur can be bought in concentrated form ready prepared, or can be made in the orchard. The latter procedure is more economical, but is seldom practised on account of the trouble involved. Also since the strength of the product is uncertain, it is necessary, for satisfactory results, to submit a sample for analysis and advice regarding the strength at which it should be used.

Formula for home-made lime sulphur:—

Flowers of sulphur ..	100 lb.
Good burnt lime	50 lb.
Water	50 gallons.

Preparation.—Place half the water in an iron vessel and bring to the boil. While this is heating stir in the lime. Mix the sulphur into a paste and add to the vessel, stirring until the lime is slaked and the contents well mixed. Add the rest of the water and boil for three-quarters of an hour to an hour, but not longer. Strain the orange-red liquid free from any sediment, and store in an air-tight container.

Dilution of Concentrates.—Lime sulphur concentrates both home made and commercial contain a number of different compounds of sulphur and calcium but owe their fungicidal value very largely to the sulphur which is present in what is known technically as the polysulphide form. The quantity of polysulphide present is also an important factor in determining the strength at which a particular brand of lime sulphur is likely to cause spray injury. For these two reasons a knowledge of the amount of polysulphide sulphur available is necessary when determining the dilution required to make up a suitable spray.

For the reason that the Baumé test does not give a definite indication of the quantity of polysulphide sulphur present the Baumé hydrometer and dilution table are not as extensively used as formerly. It is found advantageous to express the strength of the spray in the more exact terms of the final polysulphide content. A 1 in 20 lime sulphur spray made from a concentrate containing 20 per cent. of polysulphide sulphur would then have a 1 per cent. polysulphide content.

Regulations now require that the polysulphide sulphur content of any brand of lime sulphur shall be shown on the label. For the sake of uniformity this is expressed in terms of weight in weight of solution. Knowing the poysulphide content of the concentrated lime sulphur the amount of this concentrate required to make up any given spray may then be obtained by reference to the accompanying table (Table I). In

TABLE I.—QUANTITY OF LIME SULPHUR REQUIRED TO MAKE 40 GALLONS OF SPRAY FROM A CONCENTRATE OF GIVEN COMPOSITION.

Dilution based on standard concentrate (*see* text)	1 in 10.			1 in 12.			1 in 15.			1 in 25.			1 in 30.			1 in 35.			1 in 50.			1 in 80.			1 in 120.			1 in 240.		
Polysulphide content of spray	2·12			1·77			1·42			0·86			0·71			0·61			0·43			0·27			0·18			0·09		
Polysulphide content of the commercial concentrate—	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.	Gal.	Pt.	Oz.
14	5	1	0	4	2	0	3	3	10	2	0	10	1	5	10	1	3	10	1	0	0	0	5	3	0	3	8	0	1	14
15	4	6	10	4	0	0	3	1	10	1	7	10	1	5	0	1	3	0	0	7	14	0	4	16	0	3	4	0	1	12
16	4	4	0	3	6	0	3	0	0	1	6	10	1	4	0	1	2	0	0	7	4	0	4	10	0	3	0	0	1	10
17	4	2	0	3	4	0	2	6	10	1	5	10	1	3	10	1	1	10	0	6	16	0	4	5	0	2	16	0	1	8
18	4	0	0	3	2	10	2	5	10	1	5	0	1	2	10	1	1	0	0	6	8	0	4	0	0	2	13	0	1	6
19	3	6	10	3	1	10	2	4	0	1	4	0	1	2	0	1	0	10	0	6	0	0	3	16	0	2	10	0	1	5
20	3	5	0	3	0	0	2	3	0	1	3	10	1	1	10	1	0	0	0	5	15	0	3	12	0	2	8	0	1	4

N.B.—Amounts of 1 gallon and over given to the nearest half pint. Calculations based on an average specific gravity for lime sulphur of 1·2.

order to enable the user to become familiar with the new method of expression, this table gives the desired strength of spray both in the old manner as standard dilutions such as 1 in 12, and as percentage of polysulphide sulphur.

In calculating the quantity of lime sulphur required for the various dilutions, a concentrate having an 18 per cent polysulphide content has been taken as the standard. Since a well-prepared lime sulphur concentrate of 33° Baumé (the old standard) is approximately equivalent to this new standard in fungicidal properties, the strengths 1 in 12, 1 in 15, and so on, will have the same value in the new table as in the older Baumé one. To make a spray containing 1·42 per cent. polysulphide (in the older way of expressing it, a 1 in 15 dilution) from a brand of lime sulphur containing 16 per cent. polysulphide look to the vertical column of the table headed by "1·42" and "1 in 15," and then the figure in this column and also lying in the horizontal line referring to the 16 per cent. polysulphide concentrates, gives the gallons, pints, and ounces necessary to include in 40 gallons of spray.

Spreaders.—The spreading qualities of lime sulphur may be increased by the addition of a casein spreader or one of the proprietary lines, such as Agral. Soap cannot be used with this spray.

SULPHUR.

Generally speaking sulphur dust is somewhat less effective as a fungicide than lime sulphur, but on account of the ease in application it is extensively used for the control of the powdery mildews and for some of the rust diseases. Sulphur may usually be obtained in two forms—ground sulphur consisting of lump sulphur ground to a powder, or flowers of sulphur formed by the condensation of the vapour of burning sulphur. Exactly in what way the sulphur acts is not known with certainty, but it has been shown that the finer the particles the greater the fungicidal value of the dust. Fine division also confers on the sample greater covering power and better adhering properties.

Finely-powdered lime is sometimes added to the sulphur to the extent of 25 to 50 per cent. for dusting purposes. This enables a more thorough application to be made than would otherwise be economically possible. It also reduces the chance of burning should the sulphur contain, as it sometimes does, a trace of free acid produced during the manufacturing process.

A still, warm day should be chosen for sulphuring, and if the dust is applied while the dew is on the leaves better adherence will be obtained.

Sulphur-water Mixtures.

It is sometimes more convenient and effective to apply sulphur as a wet spray. Sulphur dust alone will not mix well with water, but a number of proprietary lines such as those mentioned below have been developed to overcome this difficulty.

Wettable and Dry Mix Sulphurs.—These usually consist of sulphur powder, together with a wetting compound, such as casein or gelatine, which enables the sulphur particles to go into suspension.

Precipitated Sulphur.—This form is obtained by a chemical precipitation from certain sulphur compounds in solution. The size of the constituent particles is somewhat smaller than those of the wettable sulphurs, but it possesses little advantage over them as a fungicide.

Colloidal Sulphur.—Several trade preparations have recently been put on the market which are known collectively as colloidal sulphurs. In these the sulphur particles are of extremely minute size, the state of division being much finer than any of the forms of sulphur already mentioned. For this reason colloidal sulphur has proved an effcient fungicide, and can be recommended for use when a substitute for lime sulphur or sulphur dust is required. When colloidal sulphur is added to lime sulphur it is said to form a combination having greater fungicidal value than the lime sulphur alone.

SHIRLAN.

Shirlan AG is a fungicide recently placed on the market for use in the control of powdery mildews and other fungi. It consists of 25 per cent. salicylanilide together with a spreading agent. The value of this material as a general spray has not been fully tested out, but it has proved an excellent disinfectant for controlling squirter disease in bananas. It is also of value for preventing mould growth on certain stored commodities.

Soaking calico or duck in water to which 1 per cent. of Shirlan has been added greatly increases its resistance to mildew, and accordingly this treatment can be suggested for tobacco seed-bed covers, tents and similar material.

SEED DISINFECTION.

Many serious diseases are seed borne. Bacteria or the spores and vegetative threads of a parasitic fungus may contaminate the seed before or after harvesting, with the result that, if such seed is planted without treatment to destroy these organisms, the resulting crop is likely to develop the disease. Hence, whenever the source of the seed supply is unknown, or when the crop it was obtained from is suspected to have been diseased, seed disinfection should be practised. Especially is this advisable when the seed is to be planted on virgin land or in a field which has been rotated for some time to other crops. Starting off with seed and field clean a reasonably disease-free crop should result.

The need for disinfection also applies to the vegetative parts of plants commonly used for planting purposes, such as tubers, bulbs, suckers, and cuttings.

Several different methods are available for seed disinfection. An important consideration in determining which is to be used is whether the parasite is merely contaminating the outside of the seed or whether it has actually penetrated within the seed coat. In the former case corrosive sublimate or formalin is commonly used, while in the latter a hot water treatment is often necessary. A summary of the treatments necessary in the case of certain crops for which seed disinfection has become an established practise is given in Table II. The method of applying the disinfectants will now be described. Special modifications necessary in certain cases such as with cereals and potatoes are more fully discussed in other Departmental publications.

CORROSIVE SUBLIMATE.

This chemical, also known as mercuric chloride, is the most commonly-used substance for disinfecting vegetable and flower seeds. It may be obtained in either the powder or tablet form. The latter is

by far the more convenient form to use when small quantities of solution are required. The tablets, together with directions for making the necessary dilutions, may be obtained from a chemist. The solution should be made up in glass, crockery, or wooden containers. A metal vessel must not be used, as the chemical will eventually eat through such material.

Corrosive sublimate is a deadly poison, and certain precautions must be observed when handling it. Bottles used to contain either the pure chemical or its dilutions should be plainly labelled POISON and kept away from household articles. The solution should be got rid of by pouring it into a hole in the ground immediately after use.

Corrosive sublimate to a less extent is toxic also to plant life, and, consequently, may injure seed if improperly and carelessly used. Special attention must be paid to strength and time of immersion, as both of these vary with the particular seed treated. Table II. on page 618 gives recommendations for a number of the treatments commonly used. It will be seen that the strength chiefly used is 1 of corrosive sublimate in 1,000 parts by weight of water.

After treatment the seed should always be washed for five or ten minutes in several changes of clean water, so as to avoid prolonging the action of the poison. The temperature of the disinfecting solution is also important, and for ordinary vegetable and flower seeds should be between 60 degrees and 70 degrees F.

The procedure of seed disinfection is therefore as follows:—Enclose the seed loosely in a bag made of muslin or similar open material. Immerse in corrosive sublimate solution of the required strength for the necessary time, agitating the bag meanwhile to dislodge any air bubbles. Wash for ten minutes in running water, or in half a dozen changes of clean water. Spread out on clean paper in the shade to dry. Sow as soon as possible, as delay may result in loss in germination.

Do not replace treated seed in the old bags, but take precautions that reinfection does not take place. Corrosive sublimate loses its strength with use, and it is advisable to use a solution only once.

Corrosive sublimate is also used on a larger scale for the disinfection of seed potatoes and bulbs. In the case of the former the tubers are washed but not cut and then immersed for five minutes in a solution consisting of $\frac{1}{4}$ lb. corrosive sublimate and $1\frac{1}{4}$ lb. hydrochloric acid (spirits of salts) to $12\frac{1}{2}$ gallons of water. In the case of bulbs the usual procedure is to immerse them in a 1 in 1,000 solution of corrosive sublimate for 1 hour.

PROPRIETARY MERCURY COMPOUNDS.

Several proprietary mixtures containing mercury in different chemical combinations are now being placed on the market for use in seed treatment. Some of these are applied in solution but the more useful ones are in the form of a dust. Many of these have proved efficient substitutes for the materials previously employed and as they are in general easier to apply and are less liable to cause seed injury they will no doubt find an important place in the agricultural practices of this State as soon as their local application is more fully known. The use of certain of these, such as Agrosan and Ceresan, is already replacing older methods for the control of some cereal diseases.

TABLE II.—SUMMARY OF SEED TREATMENT FOR THE PREVENTION OF DISEASE.

Crop.	Disease.	Material.	Rate or Temperature.	Method.
Cabbage and cauliflower	Black rot (*Pseudomonas campestris*)	Corrosive sublimate	1 in 1,000	Soak for 30 minutes
	Black leg (*Phoma lingam*)	Hot water	122°F.	Soak for 30 minutes
Cucumber, watermelon, and pumpkin	Various	Corrosive sublimate	1 in 1,000	Soak for 5 to 7 minutes
Potato	Scab (*Actinomyces scabies*) and black scurf (*Corticium solani*)	(*a*) Hot formalin	1 pint in 15 gallons at 125°F.	Immerse 2½ minutes, drain and cover one hour
		(*b*) Acid corrosive sublimate	Corrosive sublimate ¼lb., hydrochloric acid 1¼ lb., water 12½ gallons	Soak 5 minutes
Tobacco	Various	Silver nitrate	1 in 1,000	Soak for 15 minutes
Tomato	Various	Corrosive sublimate	1 in 3,000	Soak for 5 minutes and rinse thoroughly
Barley	Covered smut (*Ustilago hordei*)	(*a*) Formalin	1 pint to 40 gallons	Moisten by sprinkling and cover overnight
		(*b*) Approved mercury dusts	2 oz. per bushel	Apply by dry mixing.
	Loose smut (*Ustilago nuda*)	Hot water	129°F.	Immerse for 10 minutes
Maize	Seedling blight	Approved mercury dusts	2 oz. per bushel	Apply by dry mixing.
Oats	Loose smut (*Ustilago avenae*) and covered smut (*U. levis*)	(*a*) Formalin	1 pint in 40 gallons	Moisten by sprinkling and cover overnight
		(*b*) Approved mercury dusts	2 oz. per bushel	Apply by dry mixing.
Wheat	Bunt (*Tilletia tritici* and *T. laevis*)	(*a*) Copper carbonate	2 oz. per bushel	Apply by dry mixing.
		(*b*) Approved mercury dusts	2 oz. per bushel	Apply by dry mixing.
	Loose smut (*Ustilago tritici*)	Hot water	129°F.	Immerse for 10 minutes
	Flag smut (*Urocystis tritici*)	Bluestone	1½ lb. to 10 gallons	Soak for 3 minutes

If desired the mercury dusts may be applied some time before planting and will then have some insecticidal value. It is preferable, however, to make the interval between treating and planting a short one, as a reduction in germination does sometimes occur if this interval extends for several months. Where a large quantity of seed is to be treated it should be rotated in a suitably designed box or barrel fitted with baffle boards.

It must be remembered that these materials are poisonous and treated seed must be labelled and kept away from birds and stock. It is dangerous to inhale the dust and it is necessary to avoid handling it with wet hands or a broken skin.

FORMALIN.

Commercial formalin is a 40 per cent. solution of formaldehyde gas. It is an important preventive for certain cereal diseases and is also sometimes used in place of corrosive sublimate, as, for example, in the treatment of potatoes for scab. Before use, formalin has to be diluted with water and, as the recommended strength and time of immersion varies for different purposes, reference should be made to Table II. on page 618 for a summary of the quantities and methods employed.

The procedure employed is similar to that already described for corrosive sublimate except that modifications are necessary when large quantities of material have to be treated, as for example, in the case of cereals where a sprinkling method is adopted. Unlike corrosive sublimate, formalin solution may be held in iron vessels. Take care that the seed is not recontaminated before sowing by the use of old bags or the proximity of other sources of infection, as it is no longer protected once the formalin has evaporated. To avoid losses in germination, treated seed should be planted as soon as it is dry.

HOT WATER.

A treatment with hot water has sometimes to be substituted for chemical steeps when the parasite causing a particular disease is able to penetrate to within the tissue of the seed. Ordinary disinfectants would cause serious injury if they were to be used at a strength sufficient to destroy the organisms in this position. The hot water treatment can be used in those cases in which it has been found that the parasite is killed at a lower temperature than is injurious to the host.

The method necessitates considerable care as there is usually only a small range of temperature at which the fungus or bacterium is killed and the plant remains uninjured. It is necessary to obtain a thermometer in order that the correct temperature can be determined.

As large a volume of water as can be conveniently handled should be used as it will retain a more constant temperature. The method of keeping the heat constant will depend on the amount of seed to be treated and the apparatus available. In the case of small samples of vegetable seeds when about half a kerosene tin of water is all that is required, a carefully adjusted kerosene lamp is useful. Another method is to heat the water to the required temperature and then add small amounts of boiling water from time to time to make up for the heat lost. The seed is inclosed in a loose open bag and immersed for the required time, seed and water being stirred continuously. It is then spread out to dry in a clean place and planted as soon as possible.

When bulky quantities of seed are to be treated, specially adapted apparatus may be necessary. In the case of cereals the seed is first soaked for four to five hours in cold water. Immediately prior to the heat treatment it is prewarmed by immersing it for a few seconds in water heated to about 120 degs. F., and after treatment it is cooled rapidly by plunging into cold water. By this means is made possible effective treatment with less risk of injury.

COPPER CARBONATE.

Copper carbonate in the form of a dust is extensively used for preventing smut in wheat. The dust has to be intimately mixed with the seed by rotating the two together in a box or other suitably constructed vessel. This treatment has the advantage that the germination of the seed is not affected and the seed may be treated some time before planting.

BLUESTONE.

Bluestone (copper sulphate) is also used as a preventive against certain cereal smuts. It is used in solution for which a wooden or copper vessel has to be available. The seed is immersed for the required time and then dried and sown as soon as possible. If germination is delayed some injury may result.

SOIL STERILIZATION.

It is of little or no use to go to the trouble of disinfecting seed if the seed-bed already harbours the disease-producing organism. The rapidity with which a disease may spread in the seed-bed and the risk of severe loss from damping off fungi make it specially important that attention should be given to seed-bed hygiene.

Whenever possible the seed-bed should be located on virgin land situated some distance from cultivated fields, from which it must not receive the wash. When this cannot be done, consideration should be given to sterilising the soil of the bed.

In a district where wood is abundant, sterilising by fire is a cheap and effective method. Brushwood and branches should be laid evenly over the bed and the surrounding margin. The amount of wood required can be reckoned as the equivalent of a solid layer of about 3 inches thick. The soil should be moist and neither dry nor excessively wet when firing takes place.

Sterilising by steam is by far the best method, but quite impracticable for the average grower in this State. Failing this, chemical means may be employed. Formalin, bluestone, and Cheshunt mixture are each used for this purpose.

Care should be taken that disinfected beds are not recontaminated by the introduction of foreign soil on boots and cultivation implements. The latter should be sterilized by washing in formalin solution or heating in a fire before use in the seed-bed.

FORMALIN.

The beds are prepared ready for planting and preferably should be moist but not wet. If the soil is dry use a 1 per cent. solution of formalin (1 gallon of commercial formalin in 100 gallons of water) and apply with a watering can at the rate of 10 gallons to the square yard.

If the soil is moist use a 2 per cent. solution of formalin watered on at the rate of not less than 5 gallons per square yard. The beds, as soon as treated, are covered with sacking for two or three days to keep in the fumes. They are then aired for a further ten days or until the odour of formalin can no longer be detected, after which they are ready for use.

Formalin is also useful for disinfecting tools, packing sheds, and so forth. For this purpose a 5 per cent. solution (1 pint formalin in 2½ gallons water) can be used and applied as a spray or wash.

BLUESTONE.

A solution of bluestone (copper sulphate) made by dissolving 1 lb. bluestone in 7 gallons of water has been found useful in eradicating the common soil-frequenting fungus,* *Sclerotium rolfsii,* from garden beds. This is watered on the soil at the rate of 2 gallons per square yard or until the soil is wet to a depth of six or more inches. This solution, like formalin, can not be applied to the ground in which plants are actually growing without risk of serious injury, and a few weeks should elapse before planting up a treated bed. As has been mentioned before, bluestone solution can not be held for any length of time in unpainted iron vessels without corrosion taking place.

CHESHUNT MIXTURE.

This preparation is specially useful for treating a bed of seedlings in which damping-off has appeared, since, unlike formalin and bluestone, it has no detrimental effect on growing plants with which it may come in contact. It can also be used to check soil-frequenting organisms causing root and crown rots in the flower and vegetable garden.

Formula:—

Powdered bluestone (copper sulphate)	2 parts
Fresh powdered rock ammonia (ammonium carbonate)	11 parts

If necessary crush the bluestone and rock ammonia to a fine powder. Thoroughly mix the two together in the correct proportions and keep in a tightly stoppered glass or earthenware vessel for at least twenty-four hours before using.

For use dissolve the dry mixture in water at the rate of 1 oz. to 2 gallons. Water this solution on the soil suspected to be harbouring the parasite so as to wet it thoroughly.

Wash out the can after use, since the solution will corrode metals.

* . Sclerotium.

How Animals Acquire Disease.

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NOT infrequently outbreaks of disease occur among farm stock and the owner is completely baffled as to the origin. He may have built up a herd or flock by careful selection and breeding over a long period of years; and he may have fed and tended them in a way which is in accordance with the best practice. Yet, without warning, disease may suddenly appear among them and superficially there has been no evidence as to entry or origin—no outbreaks in adjacent flocks or herds, no acquisition of new animals, and no change in the method of feeding and handling. In such cases, the owner is inclined to assign his trouble to various origins, often failing to detect the correct one.

Since the discovery that many diseases are caused by small parasites, our knowledge has very greatly increased. Some of these parasites are so small as to be beyond the powers of the best microscopes. Such an organism is spoken of as a "virus." Others may be visible microscopically, but appear only as small rods or rings, and are referred to by the man in the street as "microbes." Others, such as many intestinal worms, again, are quite large and at least big enough for much detail of their structure to be visible to the naked eye.

During the last few years particularly, we have made an intensive study of many of these organisms both inside and outside the animal's body. By this means we have gained a wealth of information, though there are still some very serious gaps in our knowledge.

Microbes are certainly responsible for many of the diseases which occur to-day among domestic animals.

Disease Carriers.—If an animal became violently ill and died when it contracted a disease, there would be no trouble, as a rule, in detecting the cause, for many of the common diseases produce characteristic symptoms and changes which are then seen at post-mortem. These are often so characteristic as to leave little doubt in one's mind as to the cause.

Acquirement of a disease, however, is not always noticed by the owner. An animal may contract a disease in a mild form and remain affected over a long period without any visible change in its outward appearance. All this time, however, it may have a diseased centre or focus somewhere within its body. From this centre the microbes may be leaving the animal by one or other of the natural openings. Contamination of the surroundings thus occurs and so other animals are affected. One of the best known examples in Queensland is pleuro-pneumonia. This is particularly bad in some of the northern pastoral areas where control of the cattle is difficult and therefore not thorough. Here we occasionally find animals which outwardly show no illness but are often in an advanced stage of the disease. Yet they may live in such a state for months, and even years, and during this period infect many other animals. Such animals are known as "carriers." Contagious abortion and swine fever are two other examples of such diseases.

The "carrier" may be the animal which looks one of the best in the herd, and is one of the last to be suspected as having been in any way responsible. Prime cattle killed in the abattoirs are occasionally found in an advanced stage of tuberculosis.

Diseases which are Spread Directly.—In many microbial diseases, the microbes cannot live for any great length of time outside the animal body. If not taken in by a new animal shortly after leaving the first one, they quickly perish. The sun, which is a powerful disinfectant, soon kills them in the outer air. Pleuro-pneumonia is a good example. In this case, the organism is so fragile that infection probably takes place by the one animal being close enough to the other to inhale the organism in its breath. Possibly tuberculosis spreads in some cases in a similar way.

Diseases which are Spread Indirectly.—The great majority of diseases are spread indirectly. By this we mean that the microbe or larger parasite leaves the body of the first animal and lives for a certain period in the water, soil, or pasture, and awaits its opportunity to infect a new animal. In some cases, the disease-producing organism may not multiply outside the body of the animal; others, particularly the larger parasites, are obliged to pass through definite stages of their life history in another animal, usually of a different species.

The group, however, falls naturally into a number of sub-groups.

Diseases Contracted from Soil, Water, Pasture, &c.—In the case of diseases like anthrax and blackleg, when death of the infected animal takes place, there are enormous numbers of microbes in the body. These are very resistant. Disintegration of the body is followed by these organisms becoming widely distributed. Water, cultivation, earthworms, and wind all contribute, and so a wide area around the spot where the animal died is soon contaminated. The chance of another animal becoming infected will largely depend on the number of visits it pays to the infected piece of ground; hence we hear of certain paddocks on a farm being associated with anthrax or blackleg.

Pastures and soils frequently become infected in a varying degree with microbes, and often according to the concentration of animals. Large numbers of disease carriers discharging on a restricted area lead to heavy infection. Thus piggeries, calf and sheep pens, and fowlyards may become badly contaminated. Infectious material may be discharged into feeding troughs, drinking places, or over wounds. Many of the larger internal parasites spend part of their life period in the soil, and concentration of animals in small areas often means a high degree of infection of such soil with these parasites.

Tuberculosis, calf scours, pig scours, strangles, contagious pneumonia of pigs, swine fever, and contagious abortion of cattle are all good examples.

Improved pasture and heavier carrying capacity have greatly facilitated the spread of some of the larger sheep parasites in parts of Australia.

Diseases Transmitted by Human Beings.—Human beings frequently transmit animal diseases indirectly. Mastitis of cows is no doubt greatly assisted in its spread by the milkers' hands.

Another example is cow pox. Swine fever may be spread on one's boots from an infected to a non-infected sty. Infection by means of instruments is not uncommon. Infected dehorning instruments have been responsible for outbreaks of anaplasmosis (a form of tick-fever in cattle). Men engaged in the control of animal diseases are obliged to be particularly careful to prevent the unwilling transmission of disease from infected to healthy herds.

Strangles can be spread by the hands or infected watering places, while lice, fleas, mange parasites, &c., are spread by the use of infected rugs and bedding.

Diseases transmitted by "intermediate hosts" (ticks, insects, &c.).—A very large number of diseases are spread through the intermediary of ticks, lice, biting flies, or other external parasites. The best known examples in this State are the tick-fevers of cattle which do not occur outside the tick areas. Spirochætosis (tick fever of fowls) is spread by the fowl tick. The heart worm of the dog, so common in North Queensland, is spread by the mosquito.

With all these insect-transmitted diseases, the microbe or larger parasite is taken up directly or indirectly by the external parasite from an infected animal and then spread to a non-infected one at a later period. In these diseases the insect or transmitting agent is known as the "intermediate host"—the host in which the microbe sojourns for a while when being transmitted from one animal to another.

There are very many offending agents which cause diseases and which require intermediate hosts. The young sheep fluke cannot develop beyond a definite stage unless it reaches the body of a certain type of snail, hence, fluke disease only occurs in areas where these snails occur, and destruction of these snails causes fluke disease to disappear. The hydatid cyst of sheep and cattle is the intermediate stage of the tape worm of the dog.

Possibly three-day sickness of cattle is also spread by means of an intermediate host, also the beef nodule of the brisket and flank of cattle in Queensland.

The number of diseases which depend entirely on intermediate hosts for their natural spread is enormous. Incidentally, their control can be attempted indirectly by destruction of the intermediate host where this is practicable. Thus destruction of the common fowl tick, which lives during the day in the cracks of the woodwork of fowl-houses and only attacks the bird at night when on the perch, removes the danger of fowl spirochætosis (tick fever).

Non-transmissible diseases.—These constitute a large group and can be naturally divided into a number of smaller groups of which we can consider two.

Nutritional diseases.—The body is a very complicated organism consisting of many parts or organs which require certain elements in the foodstuffs for their proper maintenance. Whenever any of these elements are lacking, disease may make its appearance. The food eaten by the average ruminant covers a wide range, so that any possible deficiency in one plant may be compensated by another. However, where there is a definite deficiency in the soil of certain essential elements these may be lacking in the plant food.

In many large areas throughout the whole world almost, phosphorus is deficient in the soil. There is, therefore, a corresponding deficiency in the plant. But the body of the animal consuming the plant demands a large quantity of phosphorus. In the growing animal, much of it is used in bone building, some is required in the ordinary processes of digestion, and the demand becomes more intense as milk production is increased.

Phosphorus deficiency leads to the production of brittle bone or "pegleg," as it is commonly called in Queensland. Bone chewing is often seen associated with this disease. This is merely a symptom which shows that the animal is trying to replace the deficiency in its food by chewing bones.

It has recently been shown in parts of South Australia and West Australia that the absence of the mineral called cobalt in the foodstuff causes a serious disease of cattle and sheep. The chief symptom is wasting and stunted growth. By feeding relatively minute amounts of cobalt, the disease is cured.

Although all the necessary elements may be present in a ration, yet their proportions may be so unbalanced that they lead to an improper functioning of the digestive organs, so that disease of one or other parts of the body may follow. Most dairymen are aware that their cows must receive a certain amount of roughage to give the food bulk.

When there are faults in the internal organs due to lack of proper diet, the weakness that develops allows the entrance of disease-producing agents, which would not otherwise have gained a footing. A complication of several factors may, therefore, be necessary for the outbreak of a disease. Thus, during drought periods, when the animals are reduced in condition and not infrequently greatly weakened, the disease-producing parasite may assert itself. A common example is hookworm in calves in certain of the coastal districts of Queensland. In drought years the infection has been noticed to be frequently more severe than in good seasons.

We might also add that vitamin deficiency is now recognised as a factor in nutritional diseases. Vitamins are substances which occur in a large number of plant foods, and are essential to health. Most of them are of complex chemical structure, and much is yet to be learnt concerning their exact action on the animal body.

Poisonous plants and poisons.—There are many poisonous plants which cause serious stock losses. It is unnecessary to enumerate these, for even the list of the more common ones would be too long. Most of them contain poisonous substances which are unknown; others contain hydrocyanic (prussic) acid. Many of the unknown poisons produce marked gastro-intestinal disturbances such as diarrhœa, &c. In these cases the disease usually runs an acute course and death or recovery quickly follows. There are a few, however, which produce a more chronic type of disease, such as the well-known Zamia poisoning of the north coast districts. Another well-known example is Walkabout disease of horses of the gulf district, which is caused by the eating of Whitewood. Experiments have shown, however, that considerable quantities of the plant can be eaten over long periods of time before any symptoms are shown. However, when this stage has been attained, the poison has produced such extensive changes in some of the organs that recovery is practically hopeless.

Poisonous substances such as arsenic account for many deaths among stock in Queensland. This is often due to carelessness in leaving tins or vessels containing this substance in places where cattle have access. The sludge thrown out when dips are cleaned is often left to contaminate the adjacent ground.

Strychnine has been known to cause deaths in sheep where dried pieces of meat containing strychnine have been left to poison wild dogs.

New waterpipes are sometimes responsible for lead poisoning in stock, and zinc poisoning has been seen where new tubs and buckets have been used for feeding skim milk to calves.

The careless mixing of some poisons when used for purposes of treatment accounts for occasional losses of stock. Too high a concentrate of arsenic in dipping solutions for ticks, and the careless weighing and preparation of nicotine or arsenic in sheep drenches, are sometimes followed by disastrous results.

ANTISEPTICS.

Antiseptics are useful in the treatment of a wound and may be applied in two ways:—

1. As a weak solution to wash out the interior of the wound.
2. As dressings impregnated with the antiseptic to absorb any discharge and prevent the further growth of germs. They also prevent contamination from outside sources.

Stockowners frequently use antiseptics at too great a strength, and do more harm than good. Some tissues are very susceptible to injury, and solutions should not, therefore, be used at more than the recommended strength.

Antiseptics are particularly valuable for cleansing the hands before touching a wound, and in concentrated form some can be used to sterilise instruments when boiling water is not available.

After shaving off the hair surrounding a wound, the skin requires treatment with an antiseptic solution before any surgical operation.

In emergencies, a wound should first be cleaned, then treated with an antiseptic, and protected from contamination.

Some common antiseptics are:—

Tincture of iodine—invaluable for immediate application to cuts and scratches.

Methylated spirits—used in undiluted form causes smarting, but has no ill effect on the tissues.

Permanganate of potash (commonly, though not correctly, known as Condy's fluid) can be added to boiled rain water to make a deep pink antiseptic fluid which is mild in its action.

Boric acid—a saturated solution is made by adding two teaspoonfuls to each pint of boiled rain water, and allowing the undissolved material to settle. A useful eye lotion can be prepared by mixing equal parts of the saturated solution and water.

Peroxide of hydrogen—an antiseptic and a deodorant. It is usually used at a 3 per cent. strength, and may be purchased as such. The stronger 30 per cent. solution must first be broken down to a milder form by adding nine parts of water to one of the solution.

—*W. Dixon.*

The Farmer visits the Soil Chemist.*

H. W. KERR.

IT is unfortunate that the farmer is generally too busy ploughing, or harrowing, or destroying weeds, to be able to study the wonders of the soil with which he is occupied. But to-day, let us imagine that the farmer is taking a holiday from the farm, and is able to spend a brief hour or two in a visit to the soil chemist's laboratory, and see what the chemist can show him of the wonders of the soil. As it is not convenient for us all to visit the actual laboratory we have done the next best thing and have attempted to bring the laboratory to our meeting place.

Our first question is, what is soil? It is quite obviously composed of minerals of various kinds and sizes; and if we should visit a suitable road cutting, we can generally study the transition from surface soil, through various stages of decomposition, to the original unchanged rock. Furthermore, we notice that different rocks give rise to different kinds of soil; and these differences exist in respect both of appearance and agricultural value. It is apparent, then, that the parent rock has an important bearing on the question. Let us therefore examine the rock more closely and see what we can discover. We have before us two important soil-forming rocks of coastal Queensland: the first, a *granite,* which gives rise to large tracts of alluvial canelands in the far North; and the second, a sample of *basalt,* the parent rock of the well-known red volcanic loam of the Woongarra scrub lands.

Let us examine the granite. We do not even need a magnifying glass to show us that it is composed of at least three distinct types of substance "welded" together: firstly, we observe a greasy looking semi-transparent material, which we know to be *quartz*: secondly, a rather dull, white material, which is known as *feldspar*; and finally, a shiny black material, which we can flake off with a pen-knife, and which is called *mica.* We also have before us larger specimens of these three *minerals,* as they are known to the geologist, so that they can be studied with greater ease. On exposure, over many thousands of years, these apparently permanent and resistant minerals undergo changes due to seemingly insignificant but persistent forces of nature which act on all exposed rocks. In the first place, heating and cooling cause the mineral grains to expand and shrink repeatedly, and the rock is caused to crack and shatter due to the different properties of the three minerals in this respect. The effects of rain and flowing water are to cause some of the minerals to change their character and turn into other minerals. In the case of quartz, we find that the only result of the weather—or *weathering* processes, as they are known—is to cause the larger grains to break up into smaller ones: these small grains are called

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* Address to the Queensland Society of Sugar Cane Technologists, Bundaberg Conference, 25th February, 1938, and reprinted from the *Canegrowers' Quarterly Bulletin* (Bureau of Sugar Experiment Stations, Department of Agriculture and Stock).

sand, and they are identical with the sands which we find on the seashore and elsewhere. Our second mineral, the feldspar, does not withstand the weathering process nearly so well: for it changes into a new mineral called *kaolin*—which is a Chinese word—or to give it its popular name, pipe-clay, which we see here. In the process it loses certain of its original substance, and we shall see the importance of this in a few minutes time. The third mineral—the mica—does not rot away so rapidly as the feldspar, but is certainly not so permanent as the quartz: consequently, we often find mica flakes in a granite soil, but eventually they also lose their identity, to yield up some of their substance and give rise to further types of new mineral.

Consider now the manner in which our basalt rock behaves under the influence of the weather. This rock is totally different in its make-up from the granite we have just studied: firstly, it contains no quartz, and therefore a soil formed from basalt contains no sand grains; secondly, it is composed mainly of black minerals, which are not flaky like mica, but which in large masses look like the mineral specimens we see here; but it also contains feldspar minerals, though these differ somewhat in make-up from those existing in the granite. The main feature of the basalt is that it rots away much more readily than granite, and therefore the characteristic red volcanic soil which results is generally much deeper than the light-coloured sandy type of soil which exists in association with granite.

Now let us see if these soils exhibit any evidence of the processes which I have described, or resemblance to the rocks from which they have come. The chemist employs in his laboratory methods by which the soil can be separated into the individual grains, of different sizes, of which it is composed. Such methods have been applied to a granitic and a basaltic soil, with the result we see before us (Plate 205). The granitic soil has quite a large proportion of sand grains, but also a reasonable amount of finer grains—called by the soil chemist "silt"—and finally, a percentage of still finer grains, known as "clay." Similar methods applied to the red volcanic soil show us that there is a small proportion of grains which are similar in size to the sand grains of the granitic soil, but these are grains of ironstone, and of the "rotting" products of basalt. The bulk of this soil, however, consists of silt and clay particles. The chemist will tell us, moreover, that these samples of sand, silt and clay from different soils are also very different in makeup, and these differences are very important in their influence on the fertility of the soil.

To make a long story short, the fact is that in the process of rock and mineral decay lies the clue to the value of the rock and the soil in nourishing our plants and crops: as minerals decompose we have seen that they give up portions of their substance, which can be dissolved in water: these we speak of as "plantfoods." And if the process of rotting which commences with the fresh rock minerals did not continue in the soil after it is formed, it would be quite incapable of supporting crops.

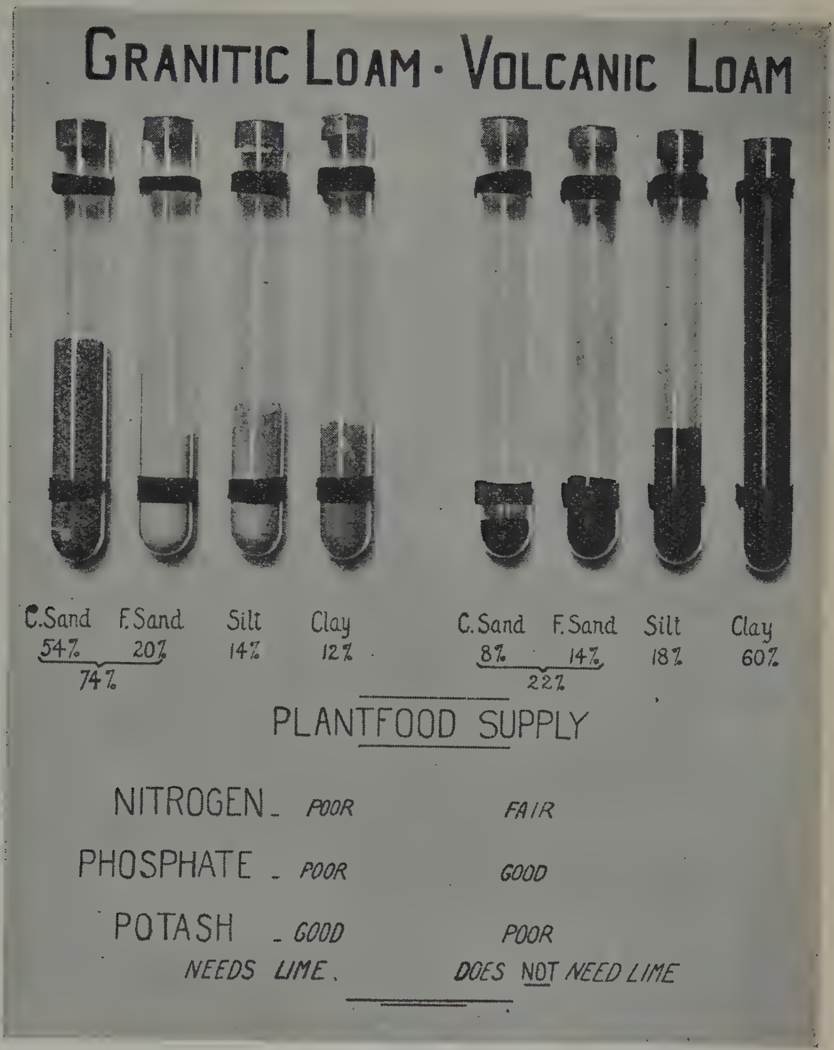

Plate 205.

Chart showing the relative amounts of coarse sand, fine sand, silt and clay in—(*a*) Granitic loam and (*b*) Red Volcanic loam. The way in which the parent rock and soil-forming processes affect the plantfood supply is also shown.

Actually, there are six such distinct mineral plantfoods which result from mineral decomposition and which are essential to crop growth: one of these is *potash,* which is yielded by some of the feldspars and mica: *calcium* (or more familiarly, lime) is yielded by other feldspars: *iron* comes largely from the black coloured rock minerals, in which we saw the basalt was so rich; and so on for the other plantfoods—*phosphate, magnesium* and *sulphur,* which make up the six.

It should now be quite a simple matter to understand why it is that certain soils contain different proportions of the individual plantfoods. Thus basalt rots readily, and as it contains several minerals rich

in lime and but few yielding potash, it usually gives a soil well supplied with lime but poor in potash. Granite, on the other hand, contains few lime-bearing minerals, but has quite a liberal supply of potash-yielding substances. It therefore is likely to give us a soil rich in potash, but probably lacking in lime. Later our chemist will carry out tests for us which will show that this is actually the case.

When the farmer grasps this truth, he will realise why it is that some soils do not yield the crops he might reasonably anticipate, even though he has cultivated the land well, and the rainfall distribution has not been unfavourable. The secret probably lies in the fact that the soil is not able to provide the crop with the correct proportions of the individual plantfoods, and it is in the farmer's interests to supplement any deficiency of supply. This introduces us to the subject of fertilizers and their use. Fertilizers are simply substances which contain soil plantfoods in concentrated form, and a small amount applied to the soil provides a relatively large quantity of plantfood in such a form that it can readily be absorbed by the crop roots. But the farmer must be careful that he uses the correct balance of plantfoods which the soil demands, or he may be piling potash on to a soil already rich in that plantfood, while neglecting the phosphate for which the crop may be starving.

The business of advising the farmer as to the food deficiencies of his land is, of course, the business of the Sugar Experiment Stations. First of all our officers must find out by fertility trials, conducted on the farms, the nature of the plantfood supply characteristic of each soil type, and then base their advice on the results actually obtained. You are all acquainted with these trials and the conclusions which are drawn from them: they are summarised each year in the January issue of the Quarterly Bulletin.

But the project of farm fertility trials is altogether too slow and laborious to enable the Bureau to give each individual block of each canegrower the specialised attention that is desirable. It was therefore necessary to devise other simpler and more rapid methods for this purpose, if at all possible. After many years of patient study we are now able to announce that we possess proven chemical tests which can be made in the laboratory, and which agree in their indications with what we actually find from farm trials. We will now call upon our chemist to demonstrate to us how he tests a soil to determine whether it is lacking in phosphate or potash (or both): while he is preparing the material for these tests, I will explain also another test which is always made on all samples received. The farmer is generally acquainted with the importance of applying lime to those soils which are sour, in order to improve their quality for crop production. Now whereas a modest lime application would never be harmful to any Queensland cane soil, it is obviously uneconomical, if not wasteful, to apply lime to soils which do not require it. We have therefore devised a very simple test which will also be demonstrated to show how we find out whether soils are sour or not. We ask our farmer friends to note carefully what we mean by "sour" soils; we refer to soils formed from rocks poorly supplied with lime, and which under conditions of high rainfall readily lose their supply; and in consequence the soil acids so released are so strong as to be harmful to the crop roots. There is another class of soil,

usually clayey in nature, which is wet and lacking in "sweetness," and which is frequently very difficult to cultivate; such soils, we know, are often improved in character by the addition of lime. But the lime in this case is for quite another purpose than neutralizing soil acids, and the farmer should formulate his own judgment in this respect; our acidity tests have no direct bearing on this phase of the problem.

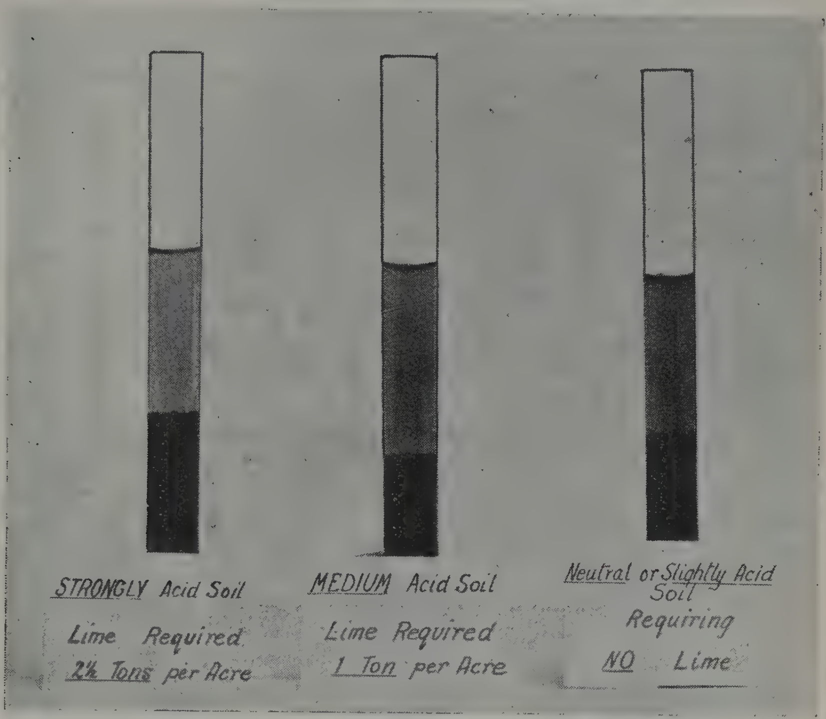

Plate 206.

Illustrating the Soil Acidity Test. The *yellow* colour of the dye solution, in the left-hand tube, showed strong acidity and the need for heavy liming; the central tube indicated medium acidity, by showing a *green* colour; while that on the right showed a strong *blue* colour, which means that no lime is required.

So far I have purposely refrained from mentioning a seventh plant-food material which is of very great importance to Queensland canegrowers. This is *nitrogen,* which comes not from the soil minerals, but from that portion of the soil which is derived from quite a different origin. From what has been discussed hitherto, one might imagine that the soil is simply a mixture of decomposed and undecomposed minerals, which are quite lifeless and inert. Actually this is far from the truth: for the soil is the inevitable receptacle for the vegetable remains of the entire plant life which it supports, and for the residues of the animal life which dwells on and in it. Such materials—known as organic matter—are also the natural food materials of the myriads of minute life—known as bacteria and fungi—which consequently occupy the soil as their natural habitat. Thus we have in the soil very distinct constituents which invest the soil with life, and which are composed of the by-products of life processes. One of these is our valuable plantfood

nitrogen. No plant or animal can exist without a supply of nitrogen, which it builds into its tissues. After it has perished, the nitrogen is once again converted, through the agency of minute soil organisms, to a state in which it is again available for further plant growth. That fraction of the soil which comprises the decomposed vegetable and animal remains is called by the soil scientist *humus,* and is one of the most important constituents of the soil from many points of view. This is one phase of the soil which is not very obvious to the farmer, though he probably is aware of its existence. A well decomposed mass of farmyard manure approaches very closely to humus in appearance and properties. But we will also ask our soil chemist to show us how the humus content of a soil may be demonstrated. (Plate 207.)

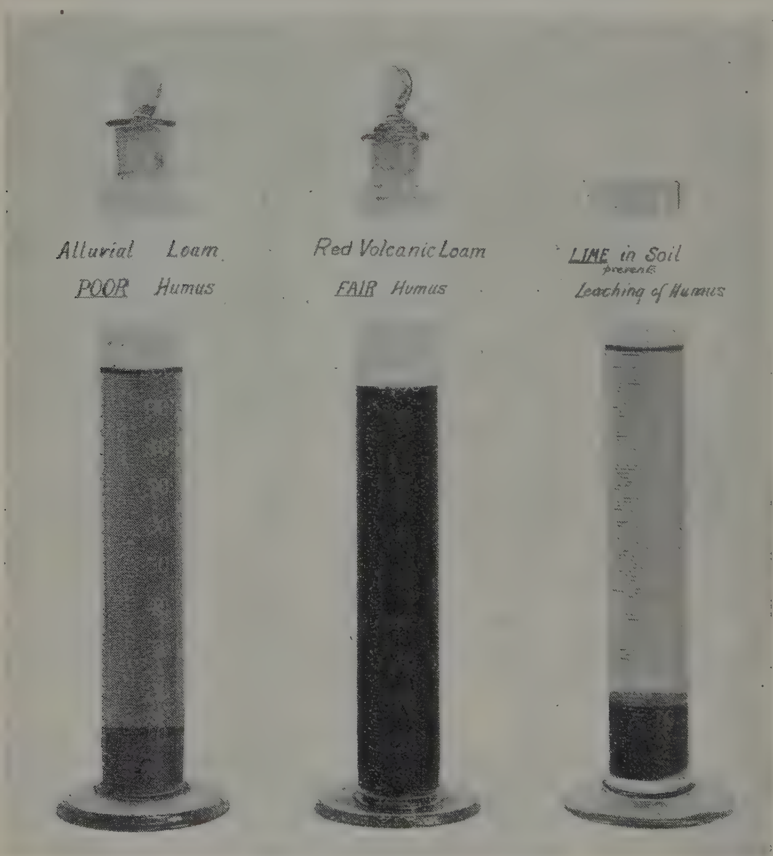

Plate 207.

Illustrating the Humus Test. The depth of colour of the liquid is a guide to the humus content of the soil; the alluvial loam is thus seen to contain less humus than the red volcanic loam. To the tube on the right, burnt lime was added; this completely removed the humus, to give a dark sediment and a clear water layer. In the soil, lime is thus instrumental in preventing the leaching of humus.

In general, the more humus the soil contains, the better is its supply of nitrogen for the purposes of plant nutrition. But unfortunately those soil conditions of high temperature and abundant

moisture, which make for rapid cane growth, are just those conditions which make also for rapid decomposition and loss of humus from the land. Hence it is that our cane soils require a supplement of available nitrogen, if they are to continue to produce profitable crops. This may be applied in the form of dried blood or meatworks offal, or as sulphate of ammonia and nitrate of soda. But such a policy is costly, and moreover, there are at the disposal of the farmer other and cheaper methods by which this process may be achieved, at least to some extent, while conferring other benefits on the soil as well.

So we finalise a rather hurried discussion of soil forming processes and their relationship to crop growth. But in addition to food, the crop must also have water, as Bundaberg canegrowers are all too frequently reminded, in the many drought periods which they experience. With your permission, I will therefore discuss briefly this phase of plant nutrition, and attempt to indicate those features of the soil which bear on the question.

It is a well-known fact that crops on clayey soils withstand droughty spells to much better advantage than do those on sandy loams. Why is this?

To provide the full story, we must go back to the constituent particles of our soil. We have seen that a sandy soil—such as is usually obtained from a granite rock—is rather rich in coarse sand particles and poor in the finer silt and clay portions. Now when a soil is wetted, the water does not actually pass "into" the soil: what really happens is that a fine film of water is formed around each of the individual grains of soil, whether they be large or small; and the quantity of water which a soil holds when wetted is largely a measure of the total area of all the surfaces of all the individual grains of the soil. To illustrate this point more clearly, suppose we take a piece of basalt rock in the form of a cube, 1 cubic inch in volume. It is seen that the surface area of such a cube is 6 square inches. If this be dipped into water and allowed to drain it is obvious that the piece of rock has merely become wetted on the surface and is not "saturated" with water. If we could now split our cube into eight smaller cubes, each ½ inch on the side, we will have increased the total surface area from 6 to 12 square inches; for the surface area of each of the small cubes is 1½ square inches, and there are eight such cubes. The surfaces of the smaller cubes will therefore retain, on wetting, twice as much water as the original cube. As we subdivide the cubes still further, the surface area of the original piece of rock becomes greater and greater: and it has been calculated that the total surface of a weight of clay particles, equal to that of the original inch cube of basalt, would actually be some hundreds of square yards. It would therefore appear that the greater the proportion of fine particles in a given weight of soil, the greater will be its capacity to take up and retain water during periods of rainfall, or when irrigation water is applied. (Plate 208.)

Again our story would not be complete if we were not to stress once more the importance of soil humus or organic matter in this connection. Whereas, in a well-drained soil, sand can hold in the form of surface

films about one-seventh of its weight of moisture, silt will hold one-quarter, and clay about one-half: but humus possesses the virtue of retaining almost *twice* its weight of moisture, to be made available to the growing crop in dry times. And so we can understand why even the modest 3 or 4 per cent. of humus which a good soil contains is so important also from the point of view of the moisture holding capacity of the soil.

Plate 208.

Illustrating the influence of soil type on water holding capacity. Equal weights of soil received equal volumes of water; it will be observed that whereas there was little surplus for drainage, with the clay soil, there was a substantial excess with the sandy soil.

Clay soils therefore hold more moisture and are more drought-resistant than sandy soils.

Finally we should point out that the individual soil grains—whether sand, silt, clay or humus—do not exist simply as a mechanical mixture, in a good agricultural soil. This condition does indeed exist in some soils which are difficult to cultivate, and when an attempt is made to bring them to a condition of good tilth, they become as fine as dust: when wetted they run together, and on drying once more become compacted to a concrete-like mass. But a first class agricultural soil is found to consist of an aggregation of small irregular crumbs which readily separate one from another when at the most desirable condition of moistness; these crumbs or granules actually consist of loose aggregates of soil grains of all dimensions, in which the sand and silt particles form a matrix which is loosely bound together by the very fine clay and humus particles. Again the humus is most important in maintaining this desirable condition in the soil. The process of intensive cultivation with implements, on the other hand, tends to destroy the granules, and the process of ploughing a soil when too wet readily provides merely an exaggerated effect of this influence.

In conclusion, let us briefly summarise what we have learned from our visit to the soil chemist's laboratory. We saw that soils were the products of rock disintegration and decomposition, whereby many of the original minerals are slowly changed to new forms, and plantfoods are liberated in the process. We learned also that different rocks decompose at different rates—some giving shallow and some deep soils. Moreover, the kinds and amounts of plant-foods yielded by any rock depended very much on the kind of minerals contained in the parent rock: and while a soil of one origin might give just the supply of plantfoods which our particular crop desires, others do not provide the "balanced diet," and the farmer must take a hand in supplementing any nutrient deficiencies, by the use of a suitable fertilizer mixture. With soils from high rainfall areas the chemist showed us that the lime is often washed away just as quickly as it is released by mineral decomposition, and under these conditions the farmer must supply lime to correct the objectionable and harmful acids which are thus produced. The chemist has also shown us the methods he employs to provide him with the intimate details of the chemical conditions of the soil.

Then we were given a demonstration of the presence of the black waxy substance present in all soils, in greater or less amounts, which we called Humus. We learned that humus is the sole source of that important plantfood nitrogen, so essential for vigorous crop growth, and so generally deficient in amount in our Queensland soil, because of the great rate at which heat and moisture combined with intensive cultivation, cause it to decompose.

And lastly, we were shown how the amount of moisture which a soil will hold after rain is governed by the coarseness or fineness of the individual mineral grains of which the soil is composed, and above all, the value of the sponge-like organic matter or humus in its ability to hold moisture.

So we come to the end of our brief excursion into the realms of soil science, though we have done nothing more than visit the outskirts. I can only wish it were practicable to venture more boldly with you and discover more of the inner secrets of the wonderful thing which we call soil, and which is the foundation of every phase of life and civilization.

Banana Growing in Queensland.

H. J. FREEMAN, Senior Instructor in Fruit Culture and Chief Inspector, Banana Industry Protection Board.

(*Continued from page* 442, *May issue,* 1938.)

WIRE TRANSPORT SYSTEMS.

A CONVEYOR system is necessary in steep and broken hillside country for the rapid transport of bunches from the plantation to the packing shed. Aerial wiring systems range from a single wire stretched from a stump within the plantation to another stump near the packing shed, along which run loose pulleys bearing short rope slings by which the bunch is suspended, to most elaborate wire rope installations.

The chief thing to do is to put these wires up as strongly as possible. For the lighter systems, special "banana wire" may be purchased for this purpose. This wire is oval in section, of high tensile steel and is in unwelded lengths of up to 1,200 yards with a breaking strain of 2,500 lb., and sold at, approximately, 50s. per coil. A lighter wire known as 10X 12 gauge has a breaking strain of 2,140 lb., is 1,200 yards in length, and costs, approximately, 30s. per coil. Both these wires are suitable for carrying the weight, but where the wire is set at too steep a grade to allow for reasonable speed of carriage, a tail wire also should be used, and for this purpose plain galvanised wire of 12 gauge is recommended at, approximately, 25s. per cwt. coil. Smaller coils are obtainable, if desired.

As a general principle, carrying wires are strung in pairs, spaced about 3 feet apart. As many wires as are desired may be strung within a plantation, but all should lead to a central landing stage within or close to the packing shed.

If no natural anchorage is available, one must be built. For this purpose, two hardwood posts 10 or 12 feet in length and from 6 to 10 inches in diameter are erected and stayed very securely. If necessary, a small landing stage may be built on to this anchorage to allow for loading the bunches, so that they will easily clear the ground when starting off on their rapid downhill flight. Holes should be bored through the top of each post and the wires passed through and made fast. A similar anchorage and platform should be made at the packing shed end, except that the anchorage should be much stronger and, with the posts spaced wider apart, as the grower may desire to bring four or even six pairs of carrying wires on to the landing. The tighter the carrying wire, the more rapid is the transit of fruit. To prevent or minimise sagging, each wire should be passed through the post or connecting cross beam and also through a round wooden roller to which it is fastened. This roller should be arranged so as to make it a really strong wire strainer and, used as such, it is an easy matter to bring each wire up to the required tension periodically. At approximately 18 inches below these carrying wires, an endless tow wire is strung by passing a 12 gauge galvanised wire round a flanged wheel of any diameter from 12 inches to 2 feet and placed horizontally by means of a bolted axle to a very substantial cross-bar, bolted to the main supports especially for this purpose. This tail or tow wire is only used

Plate 209.

BANANA WIRE PULLEY AND ROPE SLING.

The pulley is made of malleable cast steel, and is of the following dimensions:—Diameter 3 inches, width $\frac{5}{16}$ inch; depth of flange $\frac{5}{16}$ inch; rivet $\frac{5}{16}$ inch iron; frame 1 inch by $\frac{1}{4}$ inch mild steel, 14 inches long. Made up, these pulleys are 9 inches in length.

The rope sling is $\frac{3}{8}$ inch by 18 inches long, spliced at each end for preference.

as a brake, and does not need tightening beyond a reasonable degree. Loose pulleys specially riveted to short light steel frames, so well known to most Queensland growers, are used to carry the bunches. A light rope sling 18 inches long is attached to each pulley. The pulley is placed on the carrying wire, the sling twisted twice round the tail wire and half-hitched on to the bunch stem. From one to twenty bunches can be loaded on the one wire, 3 feet spacing between each bunch, in this way, then steadied as it progresses downwards, by some form of improvised brake operated by a man at the top landing applying some pressure to the wheel round which the tail wire passes. The rope slings grip the tail wire firmly, so the operator can steady up or quicken the load as required. The second load may be sent down on the opposite wire thus necessitating a similar, but reverse action of both wheels at either end of the endless tail wire. From then on, each wire may be used alternatively, or only one carrying wire may be used, in which case a continuation of bunches may be lowered at a speed, regulated only by the rapidity with which these are handled at the packing shed end. When only one wire is used, no reverse action of the tail wire is necessary, and an occasional sugar bag containing spare pulleys and slings is the only cargo sent up the second wire to the wiring head.

Some of these systems are very fast, moving as many as 250 bunches an hour. Where very long distances over broken country are necessary, a form of intermediate support is required. This is given by the erection of a post of required height to which a cross arm is bolted. On the ends of this cross arm, two iron supports are bolted. One end of this support is bolted to the cross arm, and the other is riveted to a small flanged rocker over which the carrying wire passes. Any blacksmith could make these and the job of the rockers is to prevent the carrying wire springing from the flange while under pressure of a heavy load. For this reason, an absolutely rigid support on the ends of these cross-arms is not recommended.

HARVESTING.

Harvesting is the work that all growers look forward to. One must not be too eager to market the fruit, and only fully matured bunches should be cut. By fully matured, it is meant that the fruit should be well rounded and the bunch even in appearance. Fruit intended for a local sale could be allowed to mature a little more than that intended for a distant market—such as Melbourne. But, as all bananas are now ripened artificially, bunches should not be left uncut until the stage of maturity immediately approaching full ripeness has been attained.

In some periods of the year bananas will fill out much more than at other times, and it is only by knowing the local conditions within a district that a grower is able to select his bunches to the best advantage from week to week, or from cut to cut. Much has been said about methods of making such a selection. With the experienced grower, one look at the bunch is sufficient. For those who are not so experienced, a fair guide is to break a finger off the bottom hand of the bunch. Hold this banana curve downwards in the left hand and gently press the blade of the cutting knife into the skin near the bud end of the fruit. If the skin cracks above this knife cut, the fruit is ready to market. Another test is to cut this particular banana in halves and if the pulp

Plate 210.

Yoke for carrying bunches of bananas to the wireway or packing shed.

is slightly yellow the fruit is matured. On the other hand, if the skin refuses to crack open and the fruit itself is almost white in colour, the bunch should certainly be left to hang for another week or two. Angular thin fruit should not be harvested in any circumstances.

Plate 211.

CUTTING AND CARRYING.—A cane knife is best for cutting the bunch. Under-arm carrying, as illustrated, is a wrong practice, and causes bruising.

A sharp cane knife is one of the best tools for cutting the bunches. With the first cut, several leaves are severed and fall to the ground, usually straight beneath the bunch. The second cut should sever the bunch, which may be laid conveniently on the leaves cut previously for this purpose.

With Cavendish bananas the correct method of cutting the bunch is to place the left hand firmly round the bunch stem and the left leg in against the lower portion of the bunch. Using the right hand, sever the bunch by one clean cut, leaving plenty of stem for convenience in handling later. The bunch will then rest on the left knee, and with the other hand can be laid gently on the leaves already cut and lying on the ground.

The Mons Marie variety with its lofty habit of growth requires somewhat different handling. With the cane knife, a small V-shaped cut is made about 6 feet from the ground at the front of the plant stem. This allows the stem to sag with the weight of the bunch, which is severed similarly to the Cavendish once it comes within reach of the cutter's hands.

Plate 212.

WINTER FRUIT.—Note objectionable angular formation. Summer fruit should be filled more roundly.

Plate 213.

Well-matured winter fruit of the Cavendish variety.

Plate 214.

LOADING SLIDE.—Some bag or hessian lining along the sides and ends of the frame and an armful of banana leaves on the floor of the slide prevents damage to the fruit in transit to the packing shed.

Plate 215.

BANANAS IN THE BUNCH FOR THE DOMESTIC MARKET.

In consigning fruit to local selling centres, careful handling is necessary to prevent bruising. In many districts the fruit is conveyed to the railway in utility trucks, but where bananas are grown in mountainous country and road grades are steep and the going difficult, horse transport is still the vogue.

Lady Finger and Sugar varieties are harvested in similar way, and with all varieties the plant stem must be removed by cutting off at about 12 to 15 inches from ground level and further cutting into several pieces, thus allowing for more rapid rotting. The cutting up of the plant stem may be done at the same time as the bunches are cut, or, if more monvenient, the grower may allot a special time for removing the spent stems within, say, a fortnight following the cutting of the fruit.

After cutting, the bunches are usually carried into every fourth or fifth row of plants, a few leaves being carried with each bunch on which to place it gently. This enables the grower to collect the bunches much quicker than if the fruit were laid between every row of the plantation. The importance of special care in handling bananas cannot be stressed too strongly. The use of carrying wires wherever possible is recommended. Where a horse-drawn slide is used, slide tracks should be made through the plantation, thus providing for more even and smoother running of the slide. Some hessian packing round the insides of the carrying frame of the slide is an advantage and an armful of leaves on the floor of the slide to protect the fruit from bruising is necessary. Carrying by hand in the course of harvesting is always necessary, and nothing is better for this job than the yoke used usually on banana plantations in Queensland. This allows a man of average physique to carry two bunches at a time without damaging the fruit. Carrying one bunch at a time on one's shoulders is too slow, but with care it is possible to handle the bunch in this way without damaging the fruit.

The packing shed floor should be clean and covered with an abundance of banana leaves to prevent bruising. As against hessian, or similar material, green banana leaves are best for this purpose.

The packing shed need not be elaborate in construction. If the area of the plantation does not warrant the expense of sawn timber, round bush timber, iron roof, bag sides, and a smooth, hard, earthen floor is quite suitable, but a wooden floor is of course preferable. In any case, what really is important is the cleanliness of the shed. All refuse should be swept away after each consignment has been despatched, as fungus spores may develop in rotting banana refuse and infect clean fruit. The resultant damage may not become noticeable until the fruit is in transit to the market or in the ripening rooms. The use of green banana leaves, not dry trash, is commended specially because of this risk of loss of quality in the consignment.

To pack and grade well and quickly, reasonable working space is necessary. Made up cases, already stencilled with the grower's and agent's names, should be stacked in a convenient place. A stoutly built casemaking bench should be provided inside the shed to allow for casemaking during wet weather.

Bananas are graded by measurement. When the bunches are brought in they should be dehanded and the hands stacked right side upwards, as nearly as possible according to grade, in heaps on the floor—a practice favoured by many successful growers. Some growers, however, contend that to have waist-high packing benches on which to stack the fruit is a better method. Theoretically, it may be so, but in practice it has many disadvantages, chief of which is loss of valuable time. Any damaged fruit should be discarded at once. This will speed up the actual packing considerably.

A departmental publication—"Packing Bananas for Market"—is available free on application to the Under Secretary, Department of Agriculture and Stock, Brisbane.

Cattle Dip Concentrates.

F. B. COLEMAN, Officer in Charge, Seeds, Fertilizers, Veterinary Medicines, Pest Destroyers, and Stock Foods Investigation Branch.

SECTION 3 of the Pest Destroyers Act requires all pest destroyers—which includes cattle dips—to be registered with the Department of Agriculture and Stock annually on or before the 31st January.

Standards are laid down by the Regulations under the Act, and labelling particulars are also prescribed. With respect to cattle dip concentrates, it is necessary to state on the label the percentage of arsenic by weight in the concentrate and the dilution required to give a resultant solution containing 2 lb. arsenic per 100 gallons (0·2 per cent.).

The following list sets out the cattle dips registered for the current year, the dilutions required, and the names and addresses of the persons responsible for putting them on the Queensland market.

LIST OF CATTLE DIPS REGISTERED UNDER SECTION 3, "PEST DESTROYERS ACT," FOR THE YEAR ENDING 31ST DECEMBER, 1938. LIST COMPILED 30TH APRIL, 1938.

Name of Dip.	Dilution.	Name of Queensland Wholesale Dealer.
LIQUID— *Dilution 1 in 200 or less.*	Concentrate. Water.	
Alco Liquid Cattle Dip	1 gal. to 160 gal.	Australasian Laboratories Pty. Ltd., Brisbane
Australian Liquid Dip	ditto	Australian Disinfectant Co., Brisbane
Coopers Improved Cattle Dip ..	1 gal. to 125 gal.	New Zealand Loan and Mercantile Agency Co. Ltd., Brisbane
Dalco No. 2 Single Strength Cattle Dip	1 gal. to 160 gal.	Dalgety & Co. Ltd., Brisbane
Effecto Improved Liquid Cattle Dip	ditto	Queensland Primary Producers Co-operative Association, Ltd., Brisbane
Kiltic Liquid Cattle Dip	ditto	G. Horsburgh & Co. Pty. Ltd., Maryborough
Kiltic Liquid Cattle Dip	ditto	Surgical Supplies Ltd., Brisbane
Kreeola Liquid Cattle Dip	ditto	Australian Chemical Co. Ltd., Brisbane
Littles Cattle Dip	ditto	Wilcox, Mofflin, Ltd., Brisbane
Mactaggarts Improved Liquid Cattle Dip	ditto	Mactaggarts Primary Producers' Co-operative Association Ltd., Brisbane
Non-Ox Liquid Cattle Dip ..	ditto	Australian Chemical Co. Ltd., Brisbane
Queensland Cattle Dip (Homogenous)	ditto	Australian Machinery Co. Ltd., Brisbane
Royal Cattle Dip (Homogenous) ..	ditto	Australian Machinery Co. Ltd., Brisbane
Sidolia Liquid Cattle Dip	ditto	Norris Agencies Pty. Ltd., Brisbane
Standard Non-Oxidising Liquid Cattle Dip	ditto	Queensland Chemical Distributing Co., Brisbane
Tickstroy Cattle Dip	ditto	J. H. Eden & Co., Brisbane
United Cattle Dip	ditto	United Chemical Co. Ltd., Brisbane
BAR—		
Kiltic Cattle Dip	2½ lb. to 50 gal.	Surgical Supplies Ltd., Brisbane
PASTE—		
Thomas' Carbolised Cattle Wash ..	10 lb. to 175 gal.	James Campbell & Sons Ltd., Brisbane
POWDER—		
Vallo Powder Cattle Dip	10 lb. to 200 gal.	A.Victor Leggo & Co. Ltd., Brisbane
LIQUID— *Dilution greater than 1 in 200.*		
Acco 1–300 Liquid Cattle Dip ..	1 gal. to 300 gal.	Australian Chemical Co. Ltd., Brisbane
Alco 1–320 Liquid Cattle Dip ..	1 gal. to 320 gal.	Australian Laboratories Pty. Ltd., Brisbane
Austral Liquid Cattle Dip ..	ditto	Taylors Elliotts and Australian Drug Pty. Ltd., Brisbane
Australian Double Strength Liquid Dip	ditto	Australian Disinfectant Co., Brisbane
Campbells Liquid Cattle Dip ..	ditto	Campbell Bros. Ltd., Brisbane
Concentrated Kiltic Liquid Cattle Dip	1 gal. to 300 gal.	Surgical Supplies Ltd., Brisbane
Coopers Tixol	1 gal. to 320 gal.	New Zealand Loan and Mercantile Agency Co. Ltd., Brisbane
Dalco No. 1 Double Strength Cattle Dip	ditto	Dalgety & Co. Ltd., Brisbane
Harton Cattle Dip	ditto	Chemical and Tar Products Ltd., Brisbane
Hayes Cattle Dip	1 gal. to 300 gal.	Hayes Veterinary Co., Brisbane
Hibiscus Cattle Dip Fluid ..	ditto	Queensland Pastoral Supplies Ltd., Brisbane
Kreeola Liquid Cattle Dip	ditto	Australian Chemical Co. Ltd., Brisbane
Littles Cattle Dip (Concentrated) ..	ditto	Wilcox, Mofflin, Ltd., Brisbane
Maxdip Double Strength Cattle Dip	1 gal. to 320 gal.	Mactaggarts Primary Producers' Co-operative Association Ltd., Brisbane
Royal Cattle Dip (Concentrated) ..	1 gal. to 300 gal.	Australian Machinery Co. Ltd., Brisbane
Sidolia Liquid Cattle Dip	ditto	Norris Agencies Pty. Ltd., Brisbane
Standard Non-Oxidising Liquid Cattle Dip	ditto	Queensland Chemical Distributing Co., Brisbane
Uccol Cattle Dip	1 gal. to 320 gal.	United Chemical Co. Ltd., Brisbane
Vallo Improved Fluid Cattle Dip ..	ditto	A. Victor Leggo & Co. Ltd., Brisbane
Youngs Improved Cattle Dip ..	ditto	Sturmfels Primary Producers' Co-operative Association Ltd., Brisbane

Australian Export Pig Competition.

THE first All Australian Export Pig Competition conducted by the Australian Meat Board was completed when the pig carcases were judged in London last January.

Competitors have been supplied with reports on their pig carcases, and now, for the information of the Queensland pig industry as a whole, this summarised report, with extracts from the comments submitted by the judges, has been prepared by the Pig Raising Branch of this Department.

The competition required entries of three carcases of porker or baconer pigs which were treated at Australian meatworks and exported to London, where the judging was carried out by Messrs. H. R. Davidson and Jos. B. Swain, using the recently-adopted system of carcase appraisal which was described in detail in the "Queensland Agricultural Journal" in August, 1937.

Thirteen entries of baconers and nine entries of porkers were received, all the States excepting Tasmania being represented. Unfortunately several carcases were lost in transit and this precluded several entries from participating in the awards, the entries affected included one of baconers and four of porkers, all of which were from Queensland.

Baconers.

The average marks awarded for all the entries in the baconer competition were 66·7 per cent., which is considered fairly satisfactory, as the method of marking is very severe and sets a very high standard of excellence.

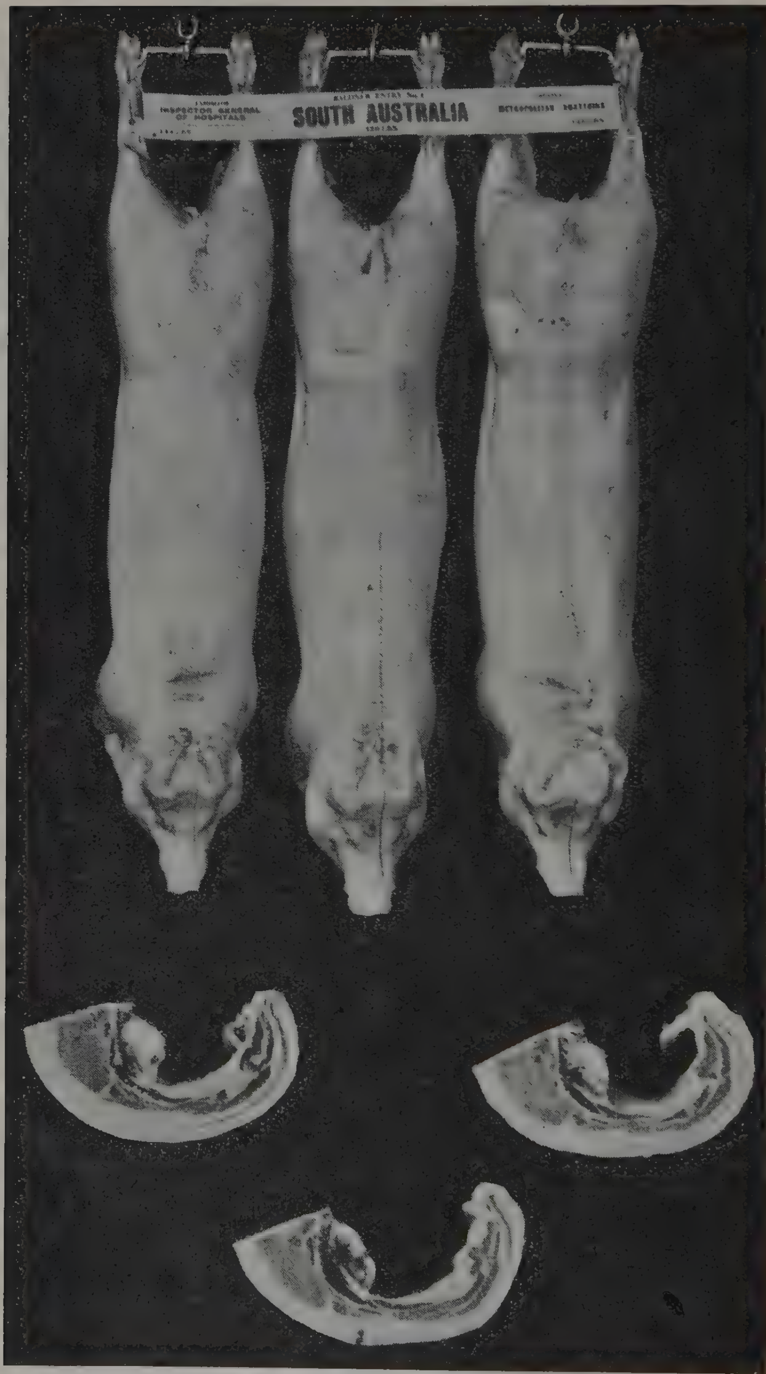

Plate 216.

EXPORT CARCASE COMPETITION.—Winning entry of baconers.

AWARD CARD.

BACONER

BREED Large White — **Inspector General of Hospitals** — Entry No. 6

	Maximum Marks	Actual	Marks	Ideal	Actual	Marks	Ideal	Actual	Marks	Ideal	Percentage
A. Inspection											
Skin											
Colour	5		5			5			5		100%
Dressing	5		5			5			5		100%
Hams	8		5			4			6		62.5%
Shoulders	7		4			5			4		61.9%
Streak	12		7			7			7		58.3%
B. By Measurement											
Eye Muscle	28	46	20	54	44	19	53	47	21	54	71.4%
Fat Thickness	20	22	18	20	16	17	19	17	17	20	86.6%
Body Length	20	745	8	805	770	15	795	780	13	815	60%
Leg Length	5	580	2	559	585	1	554	560	5	564	53.3%
Wgt. Suitability	15		15			15			15		100%
Total			89			93			98		
Total (3 Carcases)						280					74.6%

AUSTRALIAN MEAT BOARD PIG COMPETITION DEC. 1937

Judges: H. R. DAVIDSON and JOS. B. SWAIN

The following extracts from the judges' report give the headings under which the carcases were valued, together with the possible number of marks allotted for each feature, and the average marks awarded for all the entries.

"It will be noted from the judge's report following that the most serious fault with the carcases as a whole was the deficiency in body length, for which the average marks awarded were only 45·6 per cent.; this point should receive the serious consideration of breeders, as it is one of the most important features of the pig, both from the breeders' and the trade's point of view.

Skin and Colour (5 marks).—It is necessary for successful marketing that the carcase should retain its natural bloom and be free of bruise marks, scratches, bites, &c. Even though there may be some doubt as to the cause of these faults by the time they arrive at Smithfield, it is important to draw attention to them. In this direction both the Nankival and Hawtin entries were reddish in colour and lost one mark each, while the Kingston Farm Pig Co.'s exhibits lost marks for a dull, blotchy appearance which is not shown in the photographs. The Dawkins' entry was bruise marked, while the Crosby entry was slightly marked by wrinkles on the skin. The Western Australian entry only received one mark out of five, as these pigs were extremely dirty in the skin.

Dressing (5 marks).—All entries scored 100 per cent. of marks, so that this point calls for no comment.

Hams (8 marks).—The average marks for all entries are 72·3 per cent. of the possible total, and indicate that the hams are very good.

Shoulders (7 marks).—With 68 per cent. this point is not quite so good as hams, though if the Burgess entry, with only 47·6 per cent., is omitted, the other entries are very good. It is to be expected that where hams are good shoulders will not be quite so good, and vice versa.

In illustration of this the Large Whites have the lowest marks for hams and highest for shoulders. The Canadian Berkshires, with the highest marks for hams, have the lowest for shoulders.

Streaks (12 marks).—Although this point only scores 60 per cent. of possible marks the streaks must be regarded as very good and potentially better than is shown by the marking. They mostly lose marks because they are not thick enough rather than because there is not sufficient lean in them. Had there been a little more fat between the muscles many of the streaks would have earned full marks.

"Eye Muscle" of Loin (28 marks).—The standard set for this point is a severe one, as it is most important to encourage its development. An average of 59·3 per cent. of possible marks is accordingly considered to be a good result. Some of the entries, such as those from Aldridge with 75 per cent., Inspector-General of Hospitals with 71·4 per cent., and Logie with 69 per cent., deserve special mention. In some cases where the marks for the whole entry are not so good, it will be found that one poor carcase out of the three is responsible, the others being good.

Back Fat Thickness (20 marks).—The results under this heading are very good and are even better than suggested by the average of 66·1 per cent. of possible marks. Although entries Nos. 1 and 2 from the Kingston Farm Pig Co. only averaged 48 per cent. of marks, this was not due to too much fat, but to too little. A little more finish would probably have enabled these entries to equal No. 6 from the Inspector-General of Hospitals (which scored 86·6 per cent.) or No. 2 from Logie, which at 96·6 per cent. is the best score we have ever recorded under this system from any pen of three pigs.

Body Length (20 marks).—It is in respect of this point, on which the average marks of all entries only reach 45·6 per cent. of the possible, that the entries as a whole are deficient. There is, however, great variation, the difference between the best and worst being 39·7 per cent. Even within one breed, the Large Whites, there is a variation of from 48·3 per cent. to 75 per cent., which brings into prominence the two entries from the Kingston Farm Pig Co., with 71·6 per cent. and 75 per cent., respectively. At the other end of the scale the Canadian Berkshires at 13·3 per cent. do not do themselves or the breed justice.

Leg Length (5 marks).—At 72·6 per cent. of the possible this point is very good indeed, particularly considering the preponderance of Large White influence.

Suitability of Carcase Weight (15 marks).—Loss of marks in this section is entirely under the control of exhibitors, as the optimum marks for the most suitable bacon market weights, viz., 135-154 lb., have been published on several occasions and should be well known."

TABLE I.

BACONERS.

ANALYSIS OF RESULTS FOR INDIVIDUALS ON A PERCENTAGE BASIS.

—	Individual Competitors' Results.	Principal Feeds, &c.	Breeds.	Marks Awarded.	Percentage.
South Australia	Inspector-General of Hospitals (Entry No. 6)	Crushed Barley, Crushed Wheat, Crushed Peas, Skim Milk	Large White	280	74·6
Victoria	W. Logie (Entry No. 2)	Barley and Boiled Potatoes	Large White x Large White x Middle White	269	71·7
Queensland	Kingston Farm Pig Co. (Entry No. 2)	Butter Milk, Maize, Pollard, Oatmeal. Paddock reared. Finished last six weeks in pens	Large White	261	69·6
South Australia	J. W. Aldridge (Entry No. 2)	Peas, Barley, and Meat Meal	Large White	258	68·8
South Australia	Inspector-General of Hospitals (Entry No. 5)	Crushed Barley, Crushed Wheat, Crushed Peas, Skim Milk	Large White x Berkshire	257	68·5
South Australia	W. H. E. Crosby (Entry No. 3)	Mixed Corn, Skim Milk, Pollard. Free range	Large White x Tamworth x Berkshire	250	66·6
Victoria	H. C. Nankivell (Entry No. 1)	Pastured Skim Milk, Boiled Potatoes, finished with Barley, Peas, and Skim Milk	Large White	249	66·4
Victoria	F. Hawtin, (Entry No. 1)	Milk, Pollard, Crushed Barley, Yard Feed	Large White	246	65·6
South Australia	J. W. Aldridge (Entry No. 4)	Peas, Barley, and Meat Meal	Large White x Berkshire	246	65·6
Victoria	Nestle Anglo Swiss Milk Co. (Entry No. 1)	Butter Milk, Whey, and Crushed Barley. Indoors from time of birth	Tamworth x Berkshire	240	64·0
South Australia	J. H. Dawkins (Entry No. 1)	Crushed Barley and Meat Meal	Large White x Middle White x Large White	225	60·0
Western Australia	W. G. Burgess (Entry No. 1)	Wheat	Canadian Berkshire	218	58·1
Queensland	Kingston Farm Pig Co. (Entry No. 1) (Not in competition), 2 carcases only	Butter Milk, Maize, Pollard, Oatmeal. Paddock reared. Finished last six weeks in pens	Large White	172	68·8

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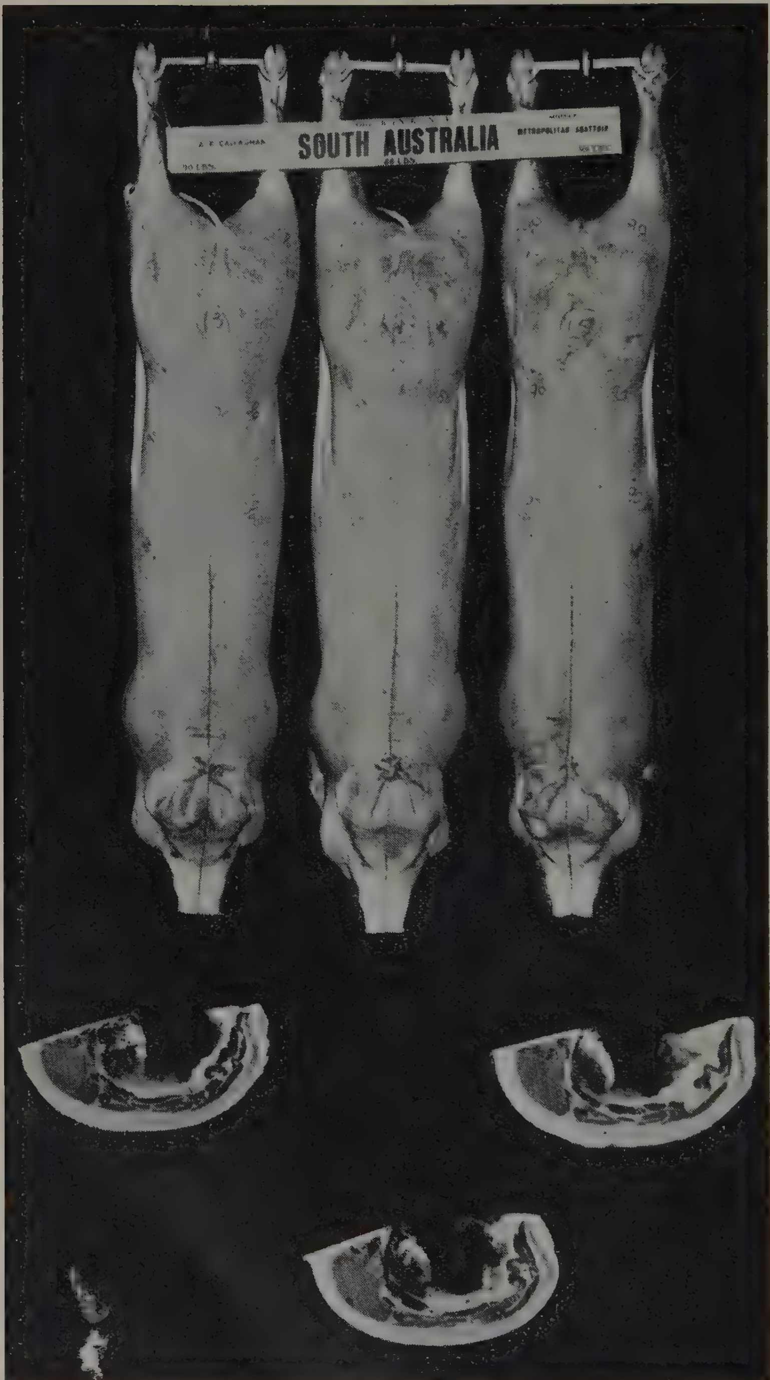


Plate 217.
EXPORT CARCASE COMPETITION.—Winning entry of porkers.

AWARD CARD.

PORKER

BREED Can. Berk. X Large White **A. H. CALLAGHAN** Entry No. 3

	Maximum Marks	Actual	Marks	Ideal	Actual	Marks	Ideal	Actual	Marks	Ideal	Percentage
A. Inspection											
Skin	5		4			4			4		80%
Colour	5		4			4			4		80%
Dressing	5		5			5			5		100%
Hams	8		6			5			5		66.6%
Shoulders	7		5			5			5		71.4%
Streak	12		9			9			6		66.6%
B. By Measurement											
Eye Muscle	28	42	20	50	42	21	50	43	21	50	73.8%
Fat Thickness	20	14	18	12	13	19	11	15	16	12	88.3%
Body Length	20	655	10	705	662	13	695	660	11	705	56.6%
Leg Length	5	485	4	479	485	3	469	475	5	479	80%
Total			85			88			82		
Total (3 Carcases)						255					73.9%

AUSTRALIAN MEAT BOARD PIG COMPETITION DEC. 1937

Judges: H. R. DAVIDSON and JOS. B. SWAIN

Porkers.

The porkers were judged by the same method as the baconers. The average marks awarded were 66·9 per cent., and the pigs were described by the judges as being of good marketable quality.

The following are extracts from the judges' reports.

Skin and Colour.—The results of 89·5 per cent. and 87·6 per cent. respectively are very good and losses are accounted for by slight bruises, scratches, bites, and a few carcases coming up a bad colour.

Dressing shows an award of 97·1 per cent., all States getting 100 per cent. except New South Wales, one mark being deducted on each carcase because the hands (forefeet) were incorrectly tied up, which tends to throw the shoulders out of shape and possibly helped to cause the low marks on shoulders.

Hams, with a result of 69·4 per cent., is quite up to standard and would have been better but for the poor result of Victoria with only 50 per cent.

Shoulders show a considerable variation in the States, the average of 63·2 per cent. being quite good, New South Wales, however, with 39 per cent., making a poor showing.

Streaks, with an average of 59·1 per cent., is possibly better than it appears, many marks being lost by thinness, not sufficient fat between the meat.

"Eye Muscle" of Loin.—The result of 65·9 per cent. is good, although there is very wide difference in many of the carcases. Special mention must be made of A. H. Callaghan, Entry No. 3, with such level results of 20-21-21 m.ms. with 73·8 per cent. award.

Back Fat, with 74 per cent., is very good and indicates that the Australian farmer realises that the British public want lean meat.

Body Length is not good, although the average of 50·[illegible] per cent. is pulled down by the Queensland entries, which gain only 31·6 per cent. It is interesting to note that these entries are all crossbred Middle Whites.

Leg Length, at 61·9 per cent., is only spoilt by the Victoria entry with 40 per cent.

TABLE II.

PORKERS.

ANALYSIS OF RESULTS OF INDIVIDUAL COMPETITORS.

—	Competitors' Results.	Principal Feeds and Husbandry.	Breeds.	Marks Awarded.	Percentage.
South Australia ..	A. Callaghan (Entry No. 3)	Mixture of Barley, Wheat, and Peas. Mainly outside feeding	Canadian Berkshire x Large White	255	73·9
South Australia ..	Inspector-General of Hospitals (Entry No. 4)	Crushed Barley, Crushed Wheat, Crushed Peas, Skim Milk	Large White x Berkshire ..	244	70·7
New South Wales	Australian Chilling and Freezing Co. (Entry No. 1)	Wheat, Butter Milk, Lime Water, Offal, and Green Feed	Large White x Tamworth..	227	65·7
South Australia ..	E. A. Farr (Entry No. 5)	Skim Milk and Crushed Barley ..	Large White x Large White x Berkshire	225	65·2
Victoria	W. Logie (Entry No. 1)	Barley and Boiled Potatoes	Large White x Large White x Middle White	210	60·8
Queensland ..	Wallace and Son (Entry No. 1) (1 pig only, 80 lb.) ..	Kitchen Refuse with Meat Meal and Maize Meal	Tamworth x Middle White	81	70·4
Queensland ..	Wallace and Son (Entry No. 2) (1 pig only, 72 lb.) ..	Kitchen Refuse with Meat Meal and Maize Meal	Middle White x Tamworth	79	68·6
Queensland ..	G. W. Winch (Entry No. 3) .. (2 pigs, 64 and 66 lb.) ..	Table Scraps, Red Comb Pig Meal, Borthwick's Mebo, No Milk, Housing Intensive System	Middle White x Berkshire ..	137	59·5
Queensland ..	G. W. Winch (Entry No. 4) .. (2 pigs, 79 and 85 lb.) ..	Table Scraps, Red Comb Pig Meal, No Milk	Middle White x Tamworth..	160	69·5

OBJECT OF REGISTRATION.

THE registration of hatcheries has for an object the distribution of healthy chickens, the progeny of parent stock of good type and production ability.

The following clauses of Regulation 29 of "*The Diseases in Poultry Acts,* 1923 *to* 1937," will indicate the obligations of owners of Registered Hatcheries:—

(iv.) He shall have all poultry at or upon or kept at or upon such hatchery tested for pullorum disease at the times and in the manner from time to time required by the Chief Poultry Expert. He shall pay to the Minister the cost of every such test.

(v.) He shall not place, permit, suffer, or allow to be placed in any incubator at such hatchery for the purpose of incubation, any egg which shall be less than 2 oz. in weight.

(vi.) He shall not sell or offer for sale any chickens other than chickens which are healthy and normal, and shall not sell or offer for sale any chickens which are deformed or injured in any way, or which have weak navels.

(vii.) He shall at all reasonable times permit the Chief Poultry Expert, any inspector, or any officer to enter into or upon such hatchery and inspect the same.

Following is a list, giving the name of the owner, of the hatcheries registered up to and including 31st May, 1938.

Name and Address.	Name of Hatchery.	Breeds kept.
G. Adler, Tinana	Nevertire ..	White Leghorns, Australorps, Rhode Island Reds, and White Wyandottes
F. J. Akers, Eight Mile Plains ..	Elmsdale ..	White Leghorns and Australorps
J. Cameron, Oxley Central ..	Cameron's ..	Australorps and White Leghorns
M. H. Campbell, Albany Creek, Aspley	Mahaca Poultry Farm and Hatchery	White Leghorns and Australorps

Name and Address.	Name of Hatchery.	Breeds kept.
R. B. Corbett, Woombye ..	Labrena ..	White Leghorns and Australorps
N. Cooper, Zillmere road, Zillmere	Graceville ..	White Leghorns
Rev. E. Eckert, Head street, Laidley	Laidley ..	Australorps, White Leghorns, and Langshans
Elks and Sudlow, Beerwah ..	Woodlands ..	Australorps and White Leghorns
Gisler Bros., Wynnum	Gisler Bros. ..	White Leghorns
J. W. Grice, Loch Lomond ..	Quarrington ..	White Leghorns
C. and C. E. Gustafson, Tannymorel	Bellevue ..	Australorps and White Leghorns
J. McCulloch, White's road, Manly	Hindes' Stud Poultry Farm	White Leghorns, Brown Leghorns, and Australorps
A. Malvine, junr., The Gap, Ashgrove	Alva ..	White Leghorns and Australorps
H. L. Marshall, Kenmore ..	Stonehenge ..	White Leghorns and Australorps
W. J. Martin, Pullenvale ..	Pennington Stud Poultry Farm	Australorps, White Leghorns, and Black Leghorns
F. S. Morrison, Kenmore ..	Dunglass ..	Australorps, Brown Leghorns, and White Leghorns
F. J. Mottram, Ibis Avenue, Deagon	Kenwood ..	White Leghorns
G. Pitt, Box 132, Bundaberg ..	Pitt's Poultry Breeding Farm	White Leghorns, Australorps, Langshans, White Wyandottes, Sussex, Rhode Island Reds, and Brown Leghorns
C. L. Schlencker, Handford road, Zillmere	Windyridge ..	White Leghorns
E. E. Smith, Beerwah	Endcliffe ..	Australorps and White Leghorns
T. Smith, Isis Junction ..	Fairview ..	White Leghorns
H. A. Springall, Progress street, Tingalpa	Springfield ..	White Leghorns
W. J. B. Tonkin, Parkhurst, North Rockhampton	Tonkin's Poultry Farm	White Leghorns and Australorps
T. Westerman, Handford road, Zillmere	Zillmere ..	Australorps and White Leghorns

Following is a list of persons who have applied for registration:

Name and Address.	Name of Hatchery.	Breeds kept.
J. L. Carrick and Son, Manly road, Tingalpa	Craigard ..	White Leghorns
T. G. Crawford, Stratford, via Cairns	Rho-Island ..	Rhode Island Reds
Mrs. A. Dvorik, Box 572, Innisfail	Coquette ..	Australorps and White Leghorns
F. J. Lambert, Acacia Vale, Townsville	Lamberts ..	Australorps and White Leghorns
J. W. Moule, Kureen	Kureen ..	White Leghorns and Australorps
J. A. Miller, Charters Towers ..	Hillview ..	White Leghorns
E. K. Pennefather, Oxley Central	..	Australorps and White Leghorns
R. H. Young, Box 18, P.O. Babinda	Reg. Young's ..	White Leghorns, Brown Leghorns, and Australorps

EFFECT OF CLIMATIC CONDITIONS ON DIFFERENT CLASSES OF POULTRY.

Two classes of birds are generally used by commercial farmers—light breeds, such as Leghorns, Anconas, and Minorcas, and heavy or dual-purpose breeds, such as Australorps, Wyandottes, and Rhode Island Reds.

Light breeds, as a rule, are of a "highly strung" nature, and very susceptible to climatic changes, particularly during the early periods of production. Rains and cold snaps will invariably check production with this type of bird. This is particularly noticeable if the birds are not housed under the intensive system. If false moults are to be avoided, the highly-strung nature of the birds also makes it inadvisable to alter their location until they have settled well into production and until spring approaches.

If, for any reason, light breeds have to be handled before the middle of, say, July, go about the work quietly and, if at all possible, work only in the afternoon, for most of the birds to lay on that day will have done so by then.

The dual-purpose breeds, on the other hand, are more docile and quiet. They are not so easily disturbed by climatic changes during the early laying stages, but are more susceptible to heat, as many dual-purpose birds lay on fat. In selecting breeders, select against this characteristic and choose the most active, alert birds. Greater liberties can be taken with dual-purpose breeds in relation to change of quarters, but do not worry them or shift them during early winter, as they are not immune from false moults.

—*P. Rumball.*

MARKING EARLY LAYING PULLETS.

The marking of early laying pullets provides a practical method of selection where the trap nest is not used.

Records obtained by trap nesting in various parts of the world show that—

(1) Early laying pullets are, as a rule, the highest producers;

(2) Birds that lay late into the autumn and are late in moulting are also high producers.

As the early layers and late moulters are high producers, a marking system will assist in distinguishing between profitable and unprofitable fowls.

In one convenient system of marking, a coloured leg band is placed on the left shank of all pullets that start to lay before six months of age. A band of another colour is attached to the left shank of pullets starting to lay when six and seven months of age, and a third coloured band is used for fowls which commence to lay in the eighth month. Pullets that do not lay until after the eighth month should be eliminated from the flock, or kept in a pen by themselves, and forced for egg production.

Pullets which are early layers show the following characteristics:—

(1) A large red comb;

(2) An active disposition and a ravenous appetite;

(3) Roominess between the keel and pelvic bones;

(4) An occasional disappearance of the yellow coloration round the vent in some yellow shanked varieties.

In small flocks, individuals showing the above characteristics may be caught in the nests and then marked.

During the following season, all fowls that were marked as late maturing the previous autumn and moult in December, January, and February can be culled. All the early laying birds and those that moult after 1st March may be kept for layers or placed in a special breeding pen and mated to a male known to have come from a high laying hen that has been trap nested. In this way the egg production of the offspring may be raised.

The method outlined is simple and, if properly employed, will raise the level of production in a flock.

—*P. Rumball.*

A HOME-MADE BRUSH.

The following simply constructed brush will be found useful for numerous purposes in workshop, cow shed or house. The bristles of the brush are made by winding a bunch of horsehair around the fingers and tying tightly in the middle with string. The ferrule or handle, tapered to one end, is cut from a piece of

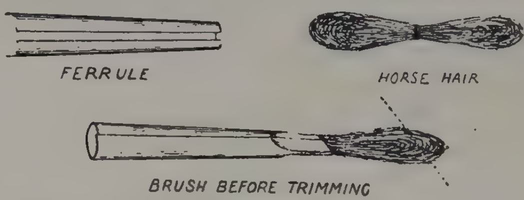


Plate 218.

galvanised iron and hammered into shape over a suitable block, the join being for the time left open. The horsehair is then inserted, the ferrule closed and the end pinched in a vice. A better job will be made if a little sealing or cobbler's wax is dropped into the ferrule before the hair is inserted, as this will help to bind it. The string can now be removed and the bristles cut to the desired shape.

A HANDY PIPE WRENCH.

A simple and efficient pipe wrench can be made as follows:—Take a piece of ordinary fencing wire 2 or 3 feet long and make a loop of it by joining the ends. Wrap this loop around the pipe and push through each end a piece of very strong

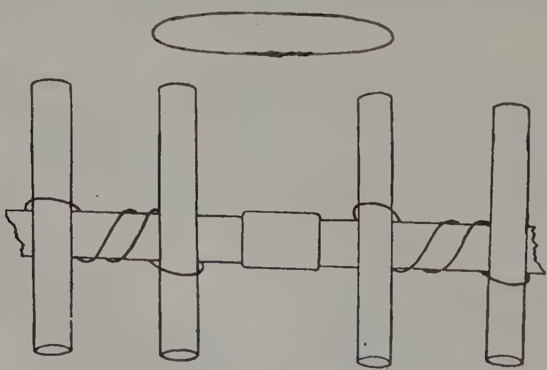
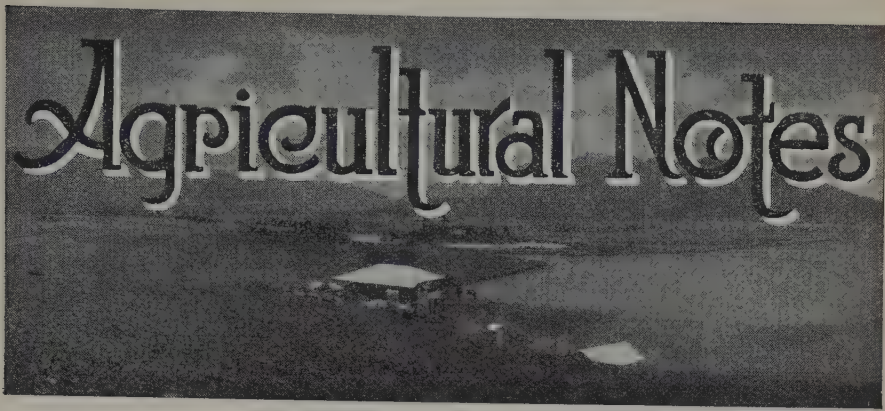


Plate 219.

wood (as shown in sketch). Turn the sticks in opposite directions and the wire will tighten on the pipe. To use apply pressure to both sticks and the pipe will screw or unscrew as the case may be.



Fodder Conservation in Central Queensland.

N. E. GOODCHILD, Instructor in Agriculture.

THE importance of fodder conservation in Central Queensland cannot be too strongly emphasised, as the transition from an extensive to an intensive use of land has become not only desirable but necessary from an economic point of view. The irregularity of the summer, and, more particularly, the winter rainfall makes it imperative to practise fodder conservation.

Adequate supplies of conserved fodder are essential to ensure continuous production of butter and other farm products. The following suggestions may assist in achieving the desired objective:—

Rotational grazing of both native and artificial grasses ensures the most profitable use of the pasture and requires the subdivision of the grazing area into small paddocks. By grazing each paddock in rotation, the grass is fed in its most nutritious form. The young green grass—continuously available when rotational grazing is practised—possesses a high protein content and little fibre, and the nutritive ingredients are very palatable and readily assimilated by stock. Under good seasonal conditions, the stock will be unable to cope with the rapidly growing grass. The surplus should be cut when the seed head has just formed, and stored as reserve fodder.

Rhodes grass, so plentiful in the scrub or rain forest areas, as well as ordinary forest grasses, can conveniently be conserved, either as hay or ensilage. While the conservation of fodder as hay is very convenient, it is interesting to note that well-made ensilage is highly nutritive, and can be held for long periods without deterioration.

Hundreds of tons of valuable green feed, which could be converted easily into nutritious fodder, are allowed to waste away annually. During the present season, enormous quantities of pasture have been allowed to seed, and the nutritive value of the herbage lost. The value of this to the farmer had it been conserved, would have been considerable.

Lucerne stands supreme as the most useful of all fodders. Unfortunately, the crop needs rather special soil conditions, but when these are favourable, at least a small area should be sown. It lends itself particularly to grazing and hay making, but the first cut or two from a new lucerne patch are often used in conjunction with some other form of fodder for ensilage.

The dry seasons which occur sometimes in Central Queensland demand quick growing crops which recover rapidly after light rains. Sudan grass is better suited to these conditions than the millets. It gives heavy yields over a season's growth; it can stand repeated cutting, and provides feed well into the winter; it produces fine quality green feed, especially after the first cutting, and may be used for either hay or ensilage; and it will grow on comparatively poor soils.

Sorghums generally are especially valuable, as they provide both a bulky and nutritious fodder. Sorghum withstands dry conditions better than maize. It also thrives on poor as well as fertile soils, and provides green, succulent feed well into the winter. When grown for use in conjunction with Sudan grass and cowpea, an excellent combination of crops for ensilage is provided. Sorghum should be harvested for ensilage when the seed is in the dough stage, and is best chaffed before the silos are filled.

The rainfall during the summer months is usually sufficient to produce summer fodder crops, but, unfortunately, winter rains are rather unreliable. In the more favoured areas, sufficient rains occur to ensure at least good fodder crops of wheat and oats.

The benefits to be derived from conserving fodders are being gradually appreciated by farmers. Excellent crops are at present being grown in some places in Western Queensland, where the bore water is suitable. Farmers in these favoured localities should utilise the available bore water for the production of fodder crops to, at least, a limited extent.

CROPS FOR WINTER AND SPRING FEED.

For winter and spring feed in coastal areas which usually have a fair winter rainfall, the winter cereals, wheat, oats, barley, and rye, are strongly recommended. If these crops are combined with a legume such as field peas or vetches, the nutritive value of the fodder is greatly enhanced.

Sowings of these crops may be continued during May. If seasonal rains are delayed, sowings may be extended until early in July, but with such late sowings the crops will only be available for a short period.

In the absence of seed drills, broadcasting is usually adopted, sowing the legume first, and discing or ploughing it under, following with the cereals which are broadcast and harrowed in.

Suitable varieties are:—Wheat—Florence, Warren, or Warchief; oats—Sunrise, Belah, or Algerian; barley—Skinless. Florence wheat, 30 lb., combined with Dun field peas at the rate of 20 lb. per acre, has proved a suitable mixture, as both are early maturing. Algerian oats, 30 lb., combined with vetches at the rate of 20 lb. per acre, make also a suitable combination, particularly for early sowing, as this mixture is considerably slower in maturing than the former. The early maturing varieties of oats, such as Belah and Sunrise, may also be sown with field peas if desired.

If individual crops are sown, the following rates of seeding per acre are recommended:—Wheat 60 lb., barley 50 lb., oats 50 lb., rye 50 lb., field peas 40 lb., vetches 30 lb.

The crop should be cut and fed direct to stock, as, where grazing is practised, wastage occurs through tramping.

Rape may also be grown now and during the winter months to provide an abundance of succulent feed for both sheep and pigs. Rape is not so suitable for dairy cattle, because of the taint which it may impart to milk, and to its tendency to induce bloat.

Rape may be sown now, drilling in 4 to 5 lb. of seed per acre. Broadleaf Dwarf Essex is the best variety.

The root crops, mangels, sugar beet, Swede turnips, and kohl-rabi may also be sown on land which has been well prepared.

A "Planet Junior" cultivator and seeder is a useful implement for this work, the seed being sown in rows 2½ feet apart, and the plants being thinned out to 1 foot intervals. Sow mangels and sugar beet at the rate of 5 to 7 lb. per acre, Swede turnips 2 to 3 lb., and kohl-rabi 2 lb.

—*H. W. Ball.*

WHEAT VARIETIES.

The census of wheat varieties sown in Queensland during 1937, compiled by the State Wheat Board, Toowoomba, from growers' returns, discloses many points of interest, the most important being the elevation of "Flora" to the premier position with 55,813 acres sown as against 41,160 acres during the previous season.

"Flora" is a medium early, moderately short-strawed grain wheat, of high quality, which has won many honours at Queensland shows, and is now attracting some attention in New South Wales. A sample of "Flora" grown at Gilgandra (yield 11 bushels per acre, with rainfall only 2 inches 10 points during growing period) was successful in winning the Commonwealth champion prize in the medium-strong white class at the recent Sydney Royal Show.

The combined area of "Three Seas" and "Seafoam," which are somewhat similar varieties, being bearded and rust resistant, was given as 67,332 acres, which is of particular significance in view of the good yields obtained, in spite of the heavy infestation of rust experienced late in the season. The area sown with "Seafoam" alone increased from 18,229 to 32,539 acres.

An area of 200,432 acres—approximately half the total area sown —was placed under twenty varieties evolved by the Department of Agriculture and Stock at Roma, and introduced into general cultivation through the medium of trial plots established throughout the Darling Downs wheat areas. The chief of these varieties, in order of present day preference, were "Flora," "Three Seas," "Seafoam," "Cedric," and "Novo."

The acreage sown of the recently introduced crossbreds, "Pusa" (C.C.C.), "Pusa-Warren" (Warput), "Pusa-Flora" (Puora), "Pusa-Gluyas" and "C.C.C. 2704" (Seaspray), also has consistently increased —the first named selection to the extent of 9,094 acres.

Unfortunately, 40,163 acres, a big proportion of the total area, was sown with unnamed varieties. Growers are strongly advised to procure pure seed of approved varieties and to maintain the purity of their seed from year to year by "rogueing" out impurities from the areas selected for seed.

The total area sown, 405,967 acres, is a gratifying increase over the previous year when 349,765 acres were cropped. A large proportion of the increased area is in the Dalby and Western Downs districts, where the greatest general expansion of grain growing is taking place. With a continuation of the present rate of expansion, Queensland growers will soon be in a position to supply State requirements regularly.

—*H. W. Ball.*

ROTATION OF CROPS.

Rotation of crops is generally necessary in most systems of farming, if the fertility and physical condition of the soil are to be maintained. Apparently, every crop requires some particular combination of plant foods, and by growing the same crop season after season on the same soil, a depletion of the main plant foods required by that crop results. Hence, after continuous cropping for some years, yields may become unprofitable. By growing different crops in rotation, the productivity of the soil may be maintained or even improved in the case of naturally inferior types of soil.

Rotational systems vary with the climatic conditions and the range of profitable crops.

Crops used in rotational systems in various parts of the world are frequently grazed off by stock, or harvested for fodder. Any accumulated manure is thus returned to the land. Where such systems are practised, the organic matter ploughed in as dung assists in maintaining the soil in a satisfactory physical condition. Where stock-raising is less important, a green manure must be included in rotations, which include nitrogen-requiring crops, to obviate any excessive depletion of nitrogen and organic matter. If climatic conditions are suitable, crops such as cowpea, soybean, clovers, and other legumes can be grown and ploughed under as green manure. Such green manuring usually increases the yields of the following crops.

In dry areas, green manuring has not proved so beneficial, as the organic matter decomposes rather slowly. Long fallows have therefore been developed, particularly in wheat-growing districts. When the crop is harvested, the land is ploughed as early as possible and left in a rough state to trap all subsequent rains. If the crop is stripped, the standing straw should be burned before ploughing, otherwise it may be difficult to obtain a compact seed-beed, and there is some risk of the following crop being deprived of nitrogen.

Crop rotation has received little attention in Queensland, because of the natural fertility of soils which have only been cultivated for a comparatively short period. Climatic conditions have also favoured the cultivation of a particular crop within a well-defined area. As a result, crops such as wheat, cotton, peanuts, and arrowroot are more or less confined to districts which have proved suitable for their successful production.

The need for a more diversified farming system, using a variety of crops in rotation, is clearly necessary in some old cultivations where specialisation in one crop has both decreased fertility and impaired the physical condition of the soil.

Properly devised rotational systems can be expected to yield larger crops, to ensure economy in the use of manures, and generally result in the more profitable working of the available land.

—*H. W. Ball.*

Selecting New Banana Areas.

WITH the approach of winter, intending banana-growers would be well advised to give serious consideration to the selection of the areas shortly to be felled for the 1938 planting.

Of late years, bananas have been grown extensively and fairly successfully on inferior forest country, but, in most instances, a suitable aspect, assisted by good cultural methods, has been the chief factor in success.

The best aspect, of course, is the north-east or northerly slope, with standing timber on all four sides to give the necessary shelter from strong winds, and these aspects ensure the maximum amount of winter sunshine.

With sites facing any further into the east than north-east, great care should be taken that, as far as possible, the area is sheltered from the cold south-east winds. An efficient windbreak on the south side of an easterly patch should, therefore, be provided for in the clearing plan. The site chosen should be so situated that tall timber or hills at the top of the proposed area will not shut out the winter sun at an early hour.

A north-westerly slope is preferable to south-east, south, or south-westerly slopes if heavy belts of timber block the strong westerly winds. Many good bananas have been grown on westerly slopes of this description, chiefly because the areas in question receive the sun during the whole of the afternoon.

All southerly slopes should be definitely avoided, more particularly if there is open country for any distance around the proposed area. Much more timber will have to be felled than actually required for planting, to obviate the long shadows which standing timber at all close to the patch throw over the plantation. The limited period during which they are exposed to the sun is the chief objection to all southerly slopes.

When one considers that a good warm-slope plantation will produce from two to three bunches to every one on the cold-slope areas, production costs, particularly to the grower on leased ground, enter so largely into the picture that intending growers with a choice of ground should always choose a warm situation to gain the best results for their work.

—*J. E. Horsley.*

PACKING SHEDS AND EQUIPMENT.

In many deciduous fruit districts marketing activities are now at a minimum and it is now possible to overhaul, repair, replace, and add to the existing packing shed equipment. Many growers carry on, season after season, with makeshift equipment, when, for a little time and a small expenditure of money, a properly-equipped packing shed could be furnished.

Packing stands, nailing-down presses and benches, sizing machines, hammers, stencils, and other equipment should all be gone over and restored to a high state of efficiency. Simple designs for packing stands, nailing-down presses, and case-making benches can be procured, and are not hard to follow by anyone who is useful with a hammer and saw. Simple forms of sizing machines can also be made at home, while those growers who have commercial machines should overhaul them thoroughly, tightening up all screws and bearings, and, if necessary, renewing the padding in the bins and feed channels. Broken parts should be replaced and power plants overhauled. Broken handles in working tools should be renewed. Case end scrapers and packing needles should be sharpened and greased and packed away until required next season.

Complete sets of new stencils can be cut. A sheet of thin zinc, a small chisel, round and flat fine-grained files, a hammer, and a piece of end-grain hardwood are the necessary tools. The designs of the letters to be cut can easily be made by obtaining stencils, and copying them on to the zinc in the design wanted. The stencilled letters are then cut out of the sheet of zinc with hammer and chisel, and, in that way, an excellent stencil is made. Stencils are easily obtained, and there is no need to use blue crayon for marking cases.

When the overhauling of plant has been completed, growers should turn their attention to the cleanliness of the packing shed. Old cases and picking boxes should be repaired or burned, a close inspection of the cracks and crevices being made for pupating insects, such as codling moths. Any shed-stored fruit, which has rotted in the cases, should be removed and destroyed and the cases thoroughly sterilized by completely immersing them in a 5 per cent. solution of formalin for at least one minute. Floors and other parts of the building affected by juice from rotted fruit should also be treated.

Close attention to these details will enable growers to make a clear start at the next harvesting period.

—*Jas. H. Gregory.*

PLANTING THE AUSTRALIAN NUT.

J. McG. WILLS, Fruit Branch.

WHERE it is proposed to plant an area of the Australian Nuts on open or forest ground, the land should now be got ready for planting time in August. Thorough deep ploughing of the area will be necessary to give the young trees a sufficient depth of a free soil in which to make a good root system. Subsoiling, if practicable, is also desirable.

When planting the young trees, a good hole, at least 2 ft. across and 18 in. in depth, should be dug so that the tap root—which is comparatively long—can be properly set vertically into the ground, and the secondary roots distributed evenly around the plant.

In digging the trees from a seed-bed, care must be taken to remove them as carefully as possible, and to get a good length of the tap root with the plant. If the tap root is injured during digging, care should be taken to cleanly prune off the injured portion above the point of mutilation. If the tap root is too long, it can be pruned back about 8 in.

It is advisable to soak the bed thoroughly the day before lifting the young trees, as this will make it easier to extract them from the ground without breaking the roots. Loosening the soil, by making a trench, 15 to 18 in. deep, alongside the rows, will simplify digging.

The trees should be planted in the ground at the same level as they were in the nursery bed, or perhaps a little deeper. Excessively deep planting should, however, be avoided.

The young trees should be well watered at the time of planting, and also subsequently, should the weather be dry.

On open land, shade should be provided by driving sufficient stakes into the ground around them to support a light hessian or bag cover.

Very often the main stem of the tree is allowed to grow too high before the top is pruned off. This will result in an ungainly, lanky tree. With the Australian Nut, as with fruit trees, pruning should aim at producing a sturdy set tree, well-balanced and fairly open.

The young trees should not be allowed to grow beyond 2 ft. in height on a single stem before the top is pruned back. Three side-shoots nicely placed are later trained to make the framework of the tree.

Many young trees do not come away well on a single stem, this failure being due to a variety of causes, and a cluster of base shoots may arise as a consequence. It will then become necessary to select the strongest and best-situated shoot to form the tree, the others being cleanly cut away.

No matter whether the trees be planted amongst bananas, pineapples, or other fruits, or in the open, a good stake should be driven alongside each tree, both to protect and support it. Many young trees are destroyed or permanently misshapen by injuries caused during cultural operations, and some protection is clearly necessary.

Where young trees have grown very densely through too many low shoots having been permitted to grow, a certain amount of thinning out of surplus main branches, or of the secondary growths, will be necessary to open up the trees to light and air.

The Fruit Market.

J. H. GREGORY, Instructor in Fruit Packing.

FOR most fruits market conditions in Brisbane during May were in a depressed condition because, mainly, of continuous dull and wet weather. In many fruit districts rivers were in high flood. In the course of a recent visit to Sydney many inspections of Queensland fruits were made. A few notes on the condition of the various fruits may be helpful to growers supplying Southern markets. These inspections provided much food for thought as to the various methods used in packing different fruits for distant markets.

PINEAPPLES.

During April, pineapple deliveries in Sydney were most unsatisfactory, a very high percentage of "water-blister" affected fruit being observed. One consignment examined immediately on delivery from the railway showed all fruit affected and unsaleable. Fruit supplied for the Queensland State exhibit, harvested and packed in Queensland on a Monday and opened on the following Thursday evening showed 75 per cent. fruit affected. The affected fruit broke down from the sides in these consignments, although some specimens in the consignment mentioned were affected down the heart, the tops pulling out easily. Fruit packed in grass appeared to be in a worse condition than that packed in woodwool. The oft-repeated suggestion that pineapples should be wrapped for distant transit is well worthy of consideration. This method is in use with Hawaiian fresh-packed pineapples for despatch to far-away markets. The material used may be either corrugated cardboard or plain paper. Bearing in mind the successful results obtained with fruit sent to Western Australia at the same time as the "Elgin" experimental shipment to England, the use of a single-layer box may also be considered. It would be necessary to experiment on a large scale to achieve definite results. It is, obviously, very important that unfavourable market reactions should be avoided.

BANANAS.

The quality of bananas seen during the period of inspections was excellent in appearance. Various types of single packs were examined. The best pack examined, in so far as lack of blemishes and solidity of pack were concerned, was the reverse pack with the fruit placed flat in each layer instead of concave side down. This pack has been recommended, but never adopted to any extent—the agents appearing to prefer the concave side down method. With this pack, it is not possible to obtain the large bulge as in the more common form of pack used. This factor may possibly assist in making the pack unpopular.

PAPAWS.

Wet weather during summer also tends to cause the same reactions as those mentioned in respect of pineapples with many lines of papaws. Papaws from Townsville, Sunnybank, and Yarwun inspected contained a high percentage of waste. Much of the fruit was mushy and soft, being only fit for fruit salad. Other consignments were green and hard, going

"specky" before ripening. Some of this fruit inspected twelve days after its arrival was still in an unsaleable condition, being still green and hard. With the coming of cold weather, growers should let the colour develop in the fruit before harvesting. Fruit will not ripen satisfactorily under the colder climatic conditions of Melbourne and Sydney. There is not a doubt that at present consignments of unsuitable papaws are being sent to Sydney, retarding the development of a constant demand for tropical fruit. As Queensland has practically a monopoly in the supply of tropical fruits, the advantage of the sound development of this trade are obvious.

CUSTARD APPLES.

Many excellent consignments of custard apples were seen in Sydney during April. The weather was unseasonably warm, with the result that the fruit ripened quickly. From some trains fruit already ripened was unloaded, and the spectacle of barrow-men selling piles of custard apples was common. No difficulty was experienced by the salesmen in making sales at 2d. to 6d. each for fruit which would pack eighteen to thirty to the case, the fruit selling readily.

The over-supply of good-quality fruit possibly will have quite a beneficial effect from an advertising point of view, enabling, as it did, Sydney people to buy custard apples at their best and cheaply. It is unfortunate that many immature custard apples are sent South, and they must often influence prospective consumers against the fruit. The packing was quite satisfactory.

CITRUS.

Some excellently packed quality grapefruit from Gayndah was noticed. Palestine and United States of America Sunkist were still on the market, providing a definite offset to the demand for Queensland fruit. Some Queensland navels also appeared during the third week of April. This fruit looked well, but tended to cut on the dry side. There should be a good market for good-quality early lines of navels, as the oranges seen in the shops were practically all old season Valencias.

Prices during the last week of May:—

The following were the ruling market prices during the last week of the month of May, 1938:—

TROPICAL FRUITS.

Bananas.

Brisbane.—Cavendish: Nines and eights, 8s. to 17s. 6d.; sevens, 8s. to 15s. 6d.; sixes, 6s. to 13s.

Sydney.—Cavendish: Nines and eights, 23s. to 26s.; sevens, 19s. to 23s.; sixes, 16s. to 19s.

Melbourne.—Cavendish: Nines and eights, 20s. to 27s.; sevens, 18s. to 22s.; sixes, 15s. to 18s.

Adelaide.—Cavendish: 23s. to 25s., all sizes.

Owing to the flooded condition of the creeks in the banana districts supplies have been short. Growers are advised not to attempt to rush extra supplies to the market by cutting fruit too closely. It is only by sending full and well-matured fruit that prices will be maintained.

Lady's Finger, 4½d. to 11d. per dozen.

Pineapples.

Brisbane.—Smoothleaf, 3s. to 4s. per case, 6d. to 3s. per dozen; Ripley, 1s. 6d. to 3s. per case, 3d. to 1s. 6d. per dozen.

Sydney.—Smoothleaf, 6s. to 10s. per tropical case.

Melbourne.—Smoothleaf, 8s. to 10s. per tropical case.

Extra care needs to be taken when handling after heavy rain, as "water blister" appears to develop to a greater extent during these periods. Growers are advised to select fruit for distant markets from the older portions of their plantations.

Papaws.

Brisbane.—Yarwun, 4s. to 6s. tropical case; Gunalda, 3s. to 3s. 6d. bushel case; Locals, 2s. to 2s. 6d. bushel case.

Sydney.—8s. to 12s. tropical case.

Melbourne.—10s. to 14s. tropical case.

Fruit should now show two-thirds colour before harvesting.

Custard Apples.

Brisbane.—2s. to 2s. 6d. Market fully supplied.

Sydney.—3s. to 6s.

Melbourne.—5s. to 8s.

Avocados.

Brisbane.—9s. to 12s.

Melbourne.—12s. to 14s.

OTHER TROPICAL FRUITS.

Rosellas.

1s. 6d. to 2s. per sugar bag.

CITRUS FRUITS.

Oranges.

Brisbane.—Commons, 5s. to 6s. per bushel case; navels to 8s.; few Gayndah specials to 10s.

Mandarins.

Brisbane.—Glens, 6s. to 10s.; Fewtrells, 3s. to 4s.; Scarlets, 5s. to 9s.; Emperors, 5s. to 8s.

Sydney.—8s. to 12s. bushel case.

Melbourne.—8s. to 10s.; specials higher.

Grapefruit.

Brisbane.—Locals, 3s. to 6s.; Gayndah, 11s. to 13s. bushel case.

Sydney.—6s. to 9s.; specials higher.

Lemons.

Brisbane.—Gayndah, 5s. to 10s.; Locals, 3s. to 6s.

DECIDUOUS FRUITS.

Apples.

Brisbane.—Jonathan, 4s. to 8s.; Granny Smith (Stanthorpe), 7s. to 9s.; Delicious, 6s. to 8s.; Tasmanian blues, 6s. to 7s.

Pears.

Brisbane.—Winter Cole, 10s. to 14s.; Kieffir, 5s. to 8s.; Beurre Bose, 6s. to 9s.; Packham's Triumph, 7s. to 9s.

Quinces.

7s. 6d. to 8s. bushel case.

OTHER FRUITS.

Tomatoes.

Brisbane.—Ripe, 3s. to 6s. half-bushel case; green, 2s. to 5s.; coloured, 3s. to 7s.; special higher.

Sydney.—Bowen tomatoes, 6s. to 8s.; Southern Queensland, 4s. to 6s.

Passion Fruit.

Brisbane.—Seconds, 7s. to 9s.; first grade, 10s. to 12s.

MISCELLANEOUS, VEGETABLES, &c.

Beetroot.—4d. to 9d. bundle.

Cucumbers.—9s. to 10s. bushel case.

Pumpkins.—4s. to 6s. bag.

Marrows.—1s. 6d. to 4s. dozen.

Lettuce.—1s. 6d. to 3s. dozen.

Cabbages.—1s. 6d. to 6s. dozen.

Beans.—*Sydney.*—4s. to 7s. per bushel case; *Melbourne.*—4d. to 7d. per lb.

Chokos.—3d. to 6d. dozen.

Cauliflowers.—2s. to 11s. dozen.

The Need of a Tree Consciousness.

Soil erosion has increased alarmingly in many of our grazing and farming areas, and the position calls for a change of attitude towards trees. Pioneering in Australia has repeatedly involved a grim struggle against trees which resulted in settlers recognising all the handicaps and few of the advantages of the native vegetation. This attitude still persists, unfortunately, in some districts, and to see gums and wattles cultivated to greatest advantage for beauty and profit one must go to New Zealand, California, Mediterranean countries, or South Africa. The attitude of the farmer is summed up frequently in the phrase— "You cannot have trees and grass too." This is true only up to a point. We are learning that it is impossible to have either crops or grass without some trees.

Many of our native trees—kurrajong, for instance—can be grown easiest from seed.

Sugar Levies—1938 Season.

Regulations under "*The Primary Producers' Organisation and Marketing Acts*, 1926 *to* 1935," have been approved, providing for levies on suppliers of cane to sugar-mills at the following rates for the season 1938 [the figures for 1936 and 1937 are given for comparison purposes]—

Name of Mill.	General Levy by Queensland Canegrowers' Council.	Administrative Levy by District Executive.	Administrative Levy by Mill Suppliers' Committee.	Special Levy by Mill Suppliers' Committee.	Total Levies for 1938.	Total Levies for 1937, given for comparison.	Total Levies for 1936, given for comparison.
	d.	d.	d.	d.	d.	d.	d.
Mossman Central	¾	1¼	..	..	2	2	2¾
Hambledon	¾	¼	¼	..	1¼	1¼	1⅜
Babinda Central	¾	¼	$\frac{1}{16}$	..	$1\frac{1}{16}$	$1\frac{3}{16}$	1¼
Mulgrave Central	¾	¼	..	..	1	1	1⅛
South Johnstone Central	¾	1½	..	..	2¼	2¼	2⅜
Goondi	¾	1½	..	..	2¼	2½	2⅜
Mourilyan	¾	1½	..	..	2¼	2¼	2¼
Tully River Central	¾	1¾	..	..	2½	2½	2½
Macknade	¾	½	½	..	1¾	1¾	1¾
Victoria	¾	½	½	..	1¾	1¾	1¾
Kalamia	¾	..	½	½	1¾	2¼	2¼
Pioneer	¾	..	1	½	2¼	2⅜	1¾
Inkerman	¾	..	½	..	1¼	1⅛	1
Invicta	¾	..	1½	..	2¼	2¼	1¾
Proserpine Central	¾	1	..	..	1¾	1¾	1¾
Cattle Creek Central	¾	½	½	..	1¾	1½	1½
Plane Creek Central	¾	½	⅜	..	1⅝	1¾	1¾
Marian Central	¾	½	¼	¼	1½	2¼	2
North Eton Central	¾	½	..	..	1¼	1¼	1¾
Pleystowe	¾	½	¼	½	2	2¼	2¼
Racecourse Central	¾	½	½	..	1¾	1¾	1¾
Farleigh	¾	½	½	..	1¾	1¾	1¾
Qunaba	¾	1½	½	..	2¾	1¾	1⅛
Bingera	¾	1½	½	..	2¾	1¾	1½
Fairymead	¾	1½	¾	..	3	2	1¾
Gin Gin Central	¾	1½	¾	..	3	2¼	1½
Millaquin	¾	1½	¼	..	2½	1½	1¼
Isis Central	¾	½	..	..	1¼	1¼	1
Maryborough	¾	¾	..	..	1½	1½	1¼
Mount Bauple Central	¾	¾	..	..	1½	1½	1¼
Moreton Central	¾	¼	1	¾	2¾	2¼	2¼
Rocky Point	¾	¼	¾	..	1¾	1½	1½
Eagleby	¾	¼	..	..	1	¾	¾

No poll will be taken in respect of the General Levy of ¾d. per ton (first column) for the Queensland Cane Growers' Council, or for the administrative levies by District Executives or Mill Suppliers' Committees (second and third columns).

In the fourth column, the levies on cane supplied to the Kalamia, Pioneer, Marian Central, and Pleystowe Mills will be used in defraying the costs of employing farmers' representatives at those mills for the current season. In the case of the Moreton Central Mill, ½d. will be

used in defraying the costs of employing a farmers' representative at the mill and ¼d. in controlling the spread of Fiji disease. In the case of these levies, growers may petition for a poll, and the petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppilers to the five mills concerned.

In addition to the foregoing levies, the undermentioned Mill Suppliers' Committees are empowered to make particular levies on growers within each of the following districts, at the following rates :—

Name of Mill Suppliers' Committee and Mill to which Cane is Supplied.	Description of District upon the Growers wherein Levies will be made and description of Cane upon the Growers whereof Levies will be made.	Amount of Levy per ton of Cane Supplied.	Purposes of Levy.
		d.	
Isis Central ..	Pialba district within the boundaries of the parishes of Urangan, Vernon, and Bingham, county March	1¾	To be used for administrative purposes by Pialba Branch of Isis Central Mill Suppliers' Committee.
Isis Central ..	All cane consigned on the railway by Government trucks from Booyal, Junien, and Marule Sidings on the Dallarnil Railway	¼	To be used for administrative purposes by Booyal Branch of Isis Central Mill Suppliers' Committee.
Mount Bauple Central	Mount Bauple district within the boundaries of the parishes of Gundiah, Tiaro, Gootchie, Curra, and St. Mary	½	To be used for administrative purposes by Mount Bauple Branch of Mount Bauple Mill Suppliers' Committee.
Maryborough ..	Pialba district within the boundaries of the parishes of Vernon, Urangan, and Bingham, county March	¾	To be used for administrative purposes by Pialba District Branch of Maryborough Mill Suppliers' Committee.
Maryborough ..	Maryborough district within the boundaries of the parishes of Tinana, Maryborough, Bidwell, Elliott, Young, and Walliebum, county March	¼	To be used for administrative purposes by Maryborough District Branch of Maryborough Mill Suppliers' Committee.
Racecourse Central	All cane hauled over Silent Grove tramline	2	To defray the costs of employing a farmers' representative of the section of growers concerned at the Racecourse Mill for the current season.
Gin Gin Central ..	All cane delivered at Morganville Railway Station	1	To defray the costs of maintaining a loading derrick at Morganville Railway Station by the section of growers concerned.
Marian Central ..	All cane loaded at Dow's Creek and Langdon Siding	¾	To be used for insurance and weighbridge maintenance by the Dow's Creek and Langdon Branch of the Marian Central Mill Suppliers' Committee.

Growers are given the opportunity of petitioning for a poll to decide whether or not the above levies shall be made. The petition must be signed by at least 100 or 50 per cent. (whichever shall be the less) of the cane suppliers within any of the areas concerned.

All petitions must reach the Secretary for Agriculture and Stock, Department of Agriculture and Stock, Brisbane, on or before the 4th July, 1938.

Full particulars of these Regulations appear in the *Government Gazette* of the 26th May, 1938, or may be obtained on application to the managers of the various sugar-mills in Queensland or to the undersigned—

R. WILSON, Acting Under Secretary,
Department of Agriculture and Stock,
Brisbane.

In Memoriam.

The Honourable WILLIAM LENNON

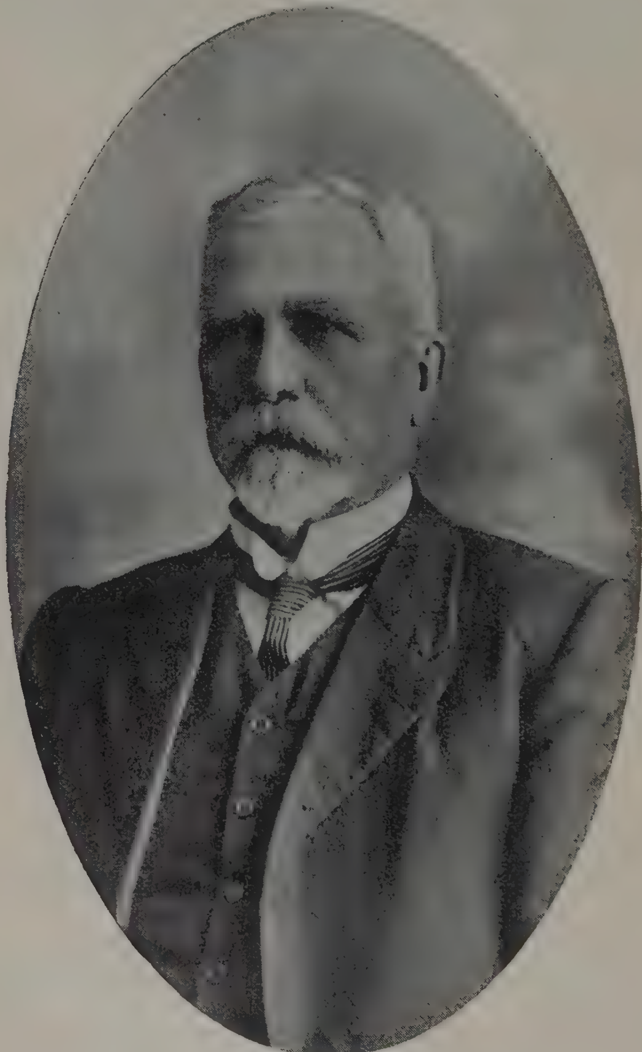


Plate 220.

BY the death of the Hon. William Lennon on 5th May, Queensland lost a great citizen and one of her foremost public men. He was successively a public servant, banker, business director, Cabinet Minister, Speaker of the Legislative Assembly, President of the Legislative Council, Lieutenant-Governor and Deputy Governor.

The late Mr. Lennon was born in Dublin in 1849. He arrived in Australia with his parents in 1855. From 1870 to 1874 he was an officer of the Mines Department of Victoria and resigned to enter the service of the Bank of Australasia, in which he passed through various offices of responsibility to the important position of Inspector. As manager, he opened the Townsville branch of the Bank in January, 1881. In 1886, mercantile pursuits attracted him and he became manager for Burns, Philp and Co., Ltd., at Townsville. Ten years later, he established his own business in the northern city. In 1907 he stood for the Herbert seat against the late Sir Alfred Cowley, and was elected to the State Parliament by a substantial majority. He continued to represent the Herbert Electorate until 1920, when he was appointed President of the Upper House and Lieutenant-Governor of the State.

While in the Legislative Assembly he was sometime Leader of the Opposition, and was Minister for Agriculture and Stock in the Ryan Government from 1915 to 1919. In the latter year, he was elected Speaker. When the Legislative Council was abolished in 1922, he retained the Lieutenant-Governorship—an office which he adorned—until his retirement in 1929. He was twice—in 1919-20 and 1925-27—Deputy Governor of Queensland.

The late Mr. Lennon was a very able man of outstanding personality, great courage, strength of character, fidelity to high principle, and the last word in old world courtesy. Of him, a biographer has said: "He was ever faithful, a true man—a gentleman in every sense of the term."

As Lieutenant-Governor of the State, Mr. Lennon, during their visits to Queensland, had the unique distinction of acting as host to two sons of His Majesty King George V.—Edward VIII., then Prince of Wales, and the present King, then Duke of York—both of whom afterwards ascended the throne; and also Queen Elizabeth, then H.R.H. the Duchess of York.

As Minister for Agriculture and Stock, Mr. Lennon is remembered as an administrator of broad vision, a wide knowledge of the requirements of rural industry and a sympathetic understanding of the problems of the farmer and the pastoralist, and especially of the difficulties of struggling settlers.

The Government had offered a State funeral, but in accordance with his own wish, expressed long ago, he was interred privately with only members of his family in attendance. In the words of a former colleague: "Simplicity, allied to natural dignity, had been a keynote of his private and public career, and the quiet funeral at Toowong Cemetery was fully in accord with William Lennon's way when he had lived."

PRODUCTION RECORDING.

List of cows and heifers officially tested by Officers of the Department of Agriculture and Stock which have qualified for entry into the advanced register of the herd books of the Australian Illawarra Shorthorn Society, and the Jersey Cattle Society, production charts for which were compiled during the month of March, 1938 (273 days unless otherwise stated).

Name of Cow.	Owner.	Milk Production.	Butter Fat.	Sire.
		Lb.	Lb.	
	AUSTRALIAN ILLAWARRA SHORTHORNS.			
	MATURE COW (STANDARD 350 LB.).			
Model II. of Alfa Vale	W. H. Thompson, Nanango	16,820·85	785·321	Reward of Fairfield
Yuruga Gentle	F. Hansen, Goodger	10,732·2	429·078	Werona Vale Handsome Boy
Novar Caprice 2nd	C. Roberts, Toowoomba	10,116·4	375·314	Statesman of Kurrawong
	SENIOR, 4 YEARS (STANDARD 330 LB.).			
Kia Ora Violet 5th	G. A. Meyers, Barwin, Imbil	9,176·35	349·921	Principal of Blacklands
	JUNIOR, 4 YEARS (STANDARD 310 LB.)			
Radford Ida 4th	E. O. Jeynes, Raceview	7,946·54	350·101	Madam's President of Avonel
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Folkestone Heather	N. Bidstrup, Ehlma, *via* Warra	10,187·37	380·922	Dinkum of Thorndale
Mabreen Plum	F. G. Haldane, Hazelbrook, Wolvi	7,319·65	297·33	Numbawarra Headlight
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Laguna Model	F. G. Lamkin, Moola, Dalby	8,160·46	356·814	Morden Marcus
Laguna Princess	F. G. Lamkin, Moola, Dalby	7,736·73	333·467	Morden Marcus
Folkestone Lemon	N. Bidstrup, Warra	9,152·89	307·629	Glenore Monarch
	JERSEY.			
	MATURE COW (STANDARD 350 LB.).			
Kathleigh Thorn's Daphne	F. W. Kath, Malakoff, Dalby	6,984·18	401·243	Retford King's Thorn
Hampstead Babette	J. H. C. Roberts, Herries street, Toowoomba	7,214·0	353·411	Kelvinside Favourite Raleigh
	SENIOR, 3 YEARS (STANDARD 290 LB.).			
Kathleigh Silvie	F. W. Kath, Malakoff, Dalby	7,467·64	444·184	Retford King's Thorn
Glenview Baroness	G. Harley, Childers	6,704·66	352·353	Glenview Goldfinder

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	SENIOR, 2 YEARS (STANDARD 250 LB.)			
Bellgarth Lucky Girl II.	D. R. Hutton, Bellgarth, Cunningham	5,316·45	321·241	Bellgarth Lucky Boy
Glenview Chrissie	F. P. Fowler and Sons, Glenview, Coalstoun Lakes	5,849·1	290·934	Trinity Governor's Hope
Glenview Nightingale	F. P. Fowler and Sons, Glenview, Coalstoun Lakes	5,425·8	289·68	Trinity Governor's Hope
Maud of Woodbine	J. Williams, Wondai	4,880·5	261·047	Brookland's Royal Gift
	JUNIOR, 2 YEARS (STANDARD 230 LB.).			
Brooklands Royal Chimes	N. Webb, Beaudesert	7,656·8	430·011	Retford Earl Victor
Brooklands Royal Babette	N. Webb, Beaudesert	7,442·25	372·741	Retford Earl Victor
Brooklands Royal Nettie	N. Webb, Beaudesert	7487·79	353·342	Retford Earl Victor
Glenmore Island Fern	L. J. Comiskey, Warra	5,697·06	265·512	Glenmore Island King
Bellegarth Bonzanette III.	G. F. Smith, Leslie, *via* Warwick	3,926·86	243·309	Trecarne Renown II.

The Tropics and Man

Some Effects upon European Communities in Tropical Areas of Co-Existent Native Populations.

DOUGLAS H. K. LEE, Professor of Physiology, University of Queensland.

1. Introductory.

AUSTRALIA was first settled by that somewhat mysterious race we speak of as the aboriginals, whose real origin and mode of advent are cloaked in obscurity. Beyond a very small infiltration of the northernmost edges by the residents of the neighbouring archipelago, these inhabitants remained undisturbed until the advent of the white man a little more than one hundred and fifty years ago. Any invasion by the Mongolian races prior to that time must have been entirely insignificant. Soon after the advent of the Caucasian, however, the attention of the other races of the Far East was turned to this continent, and immigration of their subjects commenced. At first this was tolerated and even welcomed in some quarters as a source of labour to replace the recently-abolished convict source of supply. Public sentiment and political expediency, however, soon swung the other way and the foundations of a White Australia policy were laid. This was not complete, however, as various Indian races and South Sea Islanders were granted entrance and even imported for the purpose. It was not until Federation was achieved that the complete future reservation of Australian territory and employment to Caucasian stock was affirmed. Apart from these temporary departures, however, Australian settlement has been dominantly Caucasian from its outset. This imposes upon Australian relationship with Eastern peoples, a situation which does not exist elsewhere in the tropics, and renders arguments based upon comparability of such situations futile. I do not believe that, from a broad viewpoint of the problem as a whole, the White Australia policy should be radically altered. I might summarise my conception of Australia's correct policy in this regard to be that of preserving the essential Caucasian unity of this country with admission of other races only in individual cases in which it can be clearly demonstrated that no medical, economic, or social disturbance is entailed. When, if ever, the time comes that the general populace of other races is on an equal footing with Australians in these respects, then such a policy would automatically admit such subjects, and to such a procedure no just opposition could be made.

Although I agree in essence with the "White Australia" policy, which protects Australians from immediate contact with the problems raised by racial co-existence, I do feel that it is important that Australians should understand its implications as seen in neighbouring countries. It is necessary because Australians are of a mobile disposition and travel a good deal in other countries, and unless they are acquainted with some of the aspects of racial inter-relationship beforehand, they are apt to be trapped into hasty opinions upon such subjects without being cognisant of adequate evidence. It is necessary

also because in our Mandated Territory and in Papua such conditions exist, and it particularly behoves us to avoid insularity of thought in dealing with countries so closely bound to us. It is also essential that we have a reasonable knowledge of conditions existing in neighbouring non-Australian countries with which we do trade. When I first went home to England I used to be quite annoyed by the person who, without knowing the first thing about it, stated dogmatically that he would not like to live in Australia. I now find myself reacting similarly to the Australian who confidently asserts that to live in Singapore must be a terrible existence. In commenting upon the proverbial insularity of thought of English residents, it appears we should examine our own attitude towards other countries a little more critically. If international amity is to be more than a pipe-dream, international knowledge and tolerance must first be established.

2. Medical.

Such is the volume of published work on tropical medicine and tropical hygiene, that I intend to give here only the briefest consideration to these aspects, purely for the purpose of reminding non-medical members of the salient features. That an extensive native population living under poor housing conditions, exposed to the ravages of infection through under-nourishment, cursed with traditional and religious taboos obstructing hygienic administration, constitutes a severe menace to a co-existing white population has long been recognised. Attempts to remove these disabilities or to localise their influence upon the spread of disease have met with varying success in different areas. India, in all probability, presents the most difficult problem by virtue of the enormous numbers of native subjects, the low living conditions of the great majority, and the incredible multiplicity and intricacy of traditional and religious inhibitions. It speaks volumes for the wisdom and pertinacity of the administrators that so much has been done, but the problem there is far from being solved. China presents an even more wretched picture, but here the European population is not as extensive, and a reasonable check is kept upon diseases in the great cities like Shanghai and Peiping. Malaya presents one of the brightest results. Apart from malaria, the white man is exposed to very little more risk of disease there than in our own country. The reasons for this success are numerous and owe their influence to happy coincidence. A territory of limited extent, abundance of money, enlightened native rulers accepting British advice while retaining their dignity, abundant non-seasonal rainfall, and an essentially docile and happy indigenous population all contribute their quota to ensuring success for what has been, in general, a very sound and wise European administration.

There is a reverse side to the picture of health hazards propagated by native populations, and that is the abundance of labour available for the carrying out of the extensive engineering propositions necessary for the maintenance of sanitary conditions. While it is true that more labourers are required when natives are employed, the cheapness of their hire (under existing conditions) more than compensates for this. Construction which is essential in our northern areas for adequate sanitation and development of living amenities cannot be carried out to anything like its full extent because of the excessive cost, but in a non-European country most extensive works of this nature are very often developed in areas supporting the most meagre white population. When

you consider the developments existing for European health and convenience in Singapore in terms of a white population the size of that in Mackay the contrast is astounding (excluding the harbour!).

3. Social.

It must be admitted that European interest in the lands occupied by other races has been concerned primarily with the exploitation of the natural resources of the land, a legitimate procedure, and where possible, the exploitation of the natives themselves as a source of cheap labour, a proceeding not quite so legitimate. The only argument extensively used against the White Australia policy was the possibility of obtaining cheap labour by inflation of Eastern subjects. That the native races in occupied lands have benefited by our suzerainty in matters of health, domestic peace, and living standards might constitute mitigating circumstances but does not abolish the nature of our primary interest. This attitude, of course, was very easily rationalised by obvious comparisons between European and native capacities and thus mental conflicts were avoided. It yet remains to be proved, however, how far, if at all, the different non-Caucasian races are genuinely inferior in capacity to the European, when inequality of opportunity is taken into proper consideration. This attitude, although everywhere modified from Victorian smug self-satisfaction, and in some areas almost defunct, still largely determines our individual and collective behaviour towards native races. The average native remains the beast of burden, not so much because he cannot or will not rise to a higher level, as is the case with our own labourers, as because he is not given the opportunity. In all communities, of course, there are grades of remuneration and corresponding grades of living conditions, but nowhere are the grades so immutable as in these mixed populations. The difference in living standards consequent upon this demarcation is enormous, although as an offset to this a good deal of artificial regulation of prices is attempted. (For example, the price of an article often depends upon the nationality and status of the purchaser.) Two small rooms each 10 feet square, and one narrow veranda are considered (by both parties) as quite excellent quarters for the syce and the kebun, complete with families, which may run to any number. Apart from rice, which, of course, is the staple item, the food consumed by the Chinese servants consists largely of fish heads, inferior fruit, and such items as can be withdrawn from the household supplies without undue complaint from the mem or tuan.

The rigid maintenance of such contrasts cannot but have its effect upon the European. Men in positions which would barely suffice in the home countries for the maintenance of respectability, find themselves not only vested with the necessary rights and means, but guided by pressure of public opinion into quite expansive living. To cut expenditure and save money is anti-social and vaguely damaging to the white man's prestige, unless, perchance it can be done at the expense of a native. (The same person who will go to all lengths to outshine the neighbours in the matter of domestic display will haggle over 5 cents in the market, and justify the parsimony as frustrating the cunning attempt of a native at defrauding the European!) Extravagance and thriftlessness are, under the best conditions, extraordinarily easy vices to cultivate, so that one can picture the mushroom-like growth in a forcing house such as this. (I trust I shall not be accused as a Pharisee for these remarks; I can now detect many indications of my ultimate

surrender to prevailing practice had I stayed in the East.) To such an extent does the superficial integrity of the white man determine procedure, that it is not at all an uncommon occurrence for a young man, who has been brought out by a local firm, and who has involved himself beyond recovery in debt by reckless extravagance, to have his debts settled and return passage paid by his employers, without further liability being incurred by him.

The fact that menial and routine work is very largely relegated to a subject class is apt to have an insidious effect upon the liberated individual European. It is quite true that the essence of large-scale enterprise and direction in all modern countries depends upon a similar relegation of routine and unskilled labour to dependent and lower-salaried workers, but the criterion of such partition is different and so are the surrounding circumstances. Organisation demands such differentiation in modern progress in order that the more highly-skilled person shall have his time free for employment in those tasks for which he is better fitted by reason of his peculiar skill. That he should be more highly paid is a secondary consequence of his skill, not of his liberation. That he sometimes, though by no means always, has less official working time is not germane to the discussion, as such work is usually more exhaustive of the critical mental aptitude responsible for the skill, than routine work is of unskilled ability. Specialisation, particularly in such a democratic State as this, is very much a matter of individual achievement; in mixed populations on the other hand it is very largely referable to the accident of race. Because of this arbitrary differentiation, in mixed populations, the situation is entirely different. A person thus arbitrarily lifted to a ruling plane can find in his own mind by logical search no real reason for his justification. There are simple amiable souls to whom such a conflict never presents itself, of them I have no complaint to make, though of them few are sufficiently dissatisfied to forsake their native land and migrate to the Colonies (and that is another tale!). For the rest, there is often an unresolved conflict, subconsciously demanding justification for the position, and seeking vent only in arrogance. Far be it from me to suggest that there are no people in such areas whose personal attainments justify their position. I merely wish to point out that, in the nature of things, the existence of a high minimum status for the European implies a certain amount of artificial status which could easily account for the well-recognised appearance of undue arrogance amongst the "synthetic sahibs" of such countries. The moral damage done in this way is easily extended by the indulgence made possible by the accompanying leisure time and financial facilities. I should point out again, that my remarks are directed not at all Europeans in the non-European countries, for the first-class man will be worthy of his position anywhere, and will continue to do his duty and preserve his character, and of these there are a considerable number who constitute the backbone of this Commonwealth of Nations. The man of proverbial bucolic temperament will also remain largely unspoilt. It is the mediocrities who suffer, and of these, for various reasons, there is apt to be an undue proportion in Colonial settlements.

An inevitable tendency towards laziness must be expected from an abundance of native labour supplied on a basis of social distinction rather than productive requirement, a tendency reinforced by the climate in tropical non-European countries. Actually this is not as

evident as one might imagine, at least amongst the commercial and professional population. The reason for its curtailment is not clear, but a contributory factor might easily be the continued and careful supervision of native labour required for the adequate completion of most tasks. Financial matters, particularly, call for elaborate cross-checking devices and repeated verification. The focal point of this particular attack upon white morale is the female of the species. Released from the multitudinous minor worries of maternal care by the ubiquitous amah and ayah and prevented by the white man's prestige from performing any work to be classed as menial such as cooking, fetching and carrying, &c., she has the alternative of sleeping, reading, club life, and the pursuit of some art to fill in the time between matutinal shopping and nocturnal gaiety. To few is given the power of constructive activity, and Heaven forbid that amateur effort should exceed its rightful bounds of occasional relaxation and domestic colouring. In such a plight, laziness is the least harmful result that can befall a woman.

Alcoholism has rightfully been classed as the second most prevalent tropical disease, but one should dismiss as highly exaggerated the colourful pictures beloved of the writer (and presumably reader) of "best-sellers." If there are more thorough-going drunkards in the Colonies than in the older civilisations, which I doubt, it is largely because more of the type congregate (or segregate) there. The point is that the average person drinks much more there than at home, not enough to render him obvious, even in a normal environment, but enough in many cases to undermine his health in the course of years. There is little harm in strictly limited "sundown" refreshment if no further critical work is contemplated, but social customs render it fatally easy regularly to exceed the limitation. Climate and a certain degree of isolation play an important part in encouragement of alcoholism, but I think it is also in part an indirect result of circumstances produced by native labour, as with the disabilities mentioned previously.

4. Possible Improvements and their Limitation.

So long as the races concerned remain separated by the present abyss of religious, traditional, and economic differences, so long will the position of racial co-existence remain in its present highly unsatisfactory position. Any real progress in bridging this gulf can only be achieved by very long labourious and patient work by far-seeing and quietly active workers. Only by evolutionary means can we hope for a measure of success. Blatantly advertised schemes can only evoke useless and dangerous dissatisfaction at lack of achievement within the limited space of a few years. At times a Lawrence can in a few months gain complete mastery of the non-European mind and weld the forces of the East into a solid matrix having a tangible contact with the methods of the West, but the world in general moves too slowly for use to be made of such opportunities and the inspired race must sink back again with an added sense of futility.

Equalisation of living standards, increased responsibility for the native, fundamental instead of superficial Westernisation, reciprocal understanding, may all be regarded as units in the ultimate goal, but countless years of continued effort aided by constantly revised and intensive primary education for the native masses must gradually pave the way for progress towards the ideal.

There is one feature which seems to me worthy of much greater study than it at present receives, and that is the consideration of more permanent settlement of Colonial possessions by Europeans. It is the custom for colonial residents to be taken home every three or four years for a number of months and for them to be repatriated at a comparatively early retiring age. Furthermore, it is the almost universal practice in British Colonies for the children to be sent home to school at the age of six. For the periodical long leave the stock excuse of climatic disability is put forward. Except in a very few specialised areas I cannot subscribe to the belief that climatic influence alone and dispossessed of the many evils discussed above justifies the contention. Improved adventitious conditions would undoubtedly remove a very large part of the so-called "climatic" disabilities, that would render the European more of a settler than a sojourner, and that in turn would stabilise his interest in his surroundings and lead to the creation of a less artificial existence. It is in this very respect that settlement of our own tropical areas differs so much from that of our tropical colonies, and this difference of attitude is largely bound up with the question of native labour. Once the principle of permanent residence is established adequate schools would spring up as they became freed from the prohibitive expense of long leaves for the staff, and then the very important problem of family separation would largely be solved. In the case of the child, again it is the adventitious factors which are, in general, deleterious and not the pure climatic factor.

CONVENIENT, DURABLE MILK CAN RACK.

The accompanying diagram shows a convenient and durable rack for drying and airing milk cans after washing and scalding. This rack is inexpensive and easy to build, requiring a few pieces of two by fours, and four lengths of $\frac{3}{4}$-inch

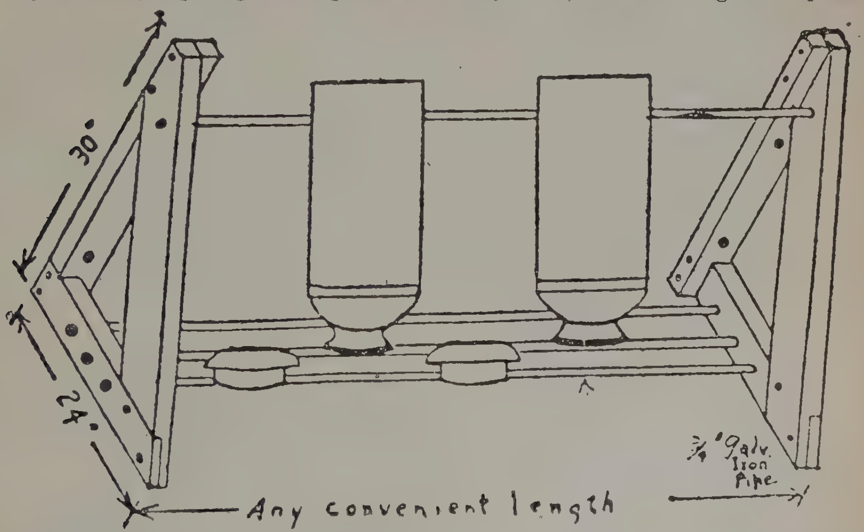

Plate 221.

galvanised iron pipe. The diagram shows the details of construction. The size may vary depending on the number of cans to be accommodated, and whether 20-quart or 40-quart cans are used. The rack fastens to the side of the dairy shed or milk house either inside or outside as preferred.

—*New Zealand Farmer.*

Answers to Correspondents

BOTANY.

Replies selected from the outgoing mail of the Government Botanist, Mr. C. T. White, F.L.S.

"Gomphrena Weed."

M.McD. (Bald Hills)—

Your specimen is *Gomphrena decumbens*, a plant of the Amaranth family, for which we have not heard a common name. On this account, it is frequently spoken of as the "Gomphrena weed." It is a native of tropical America, and first made its appearance in Queensland about ten years ago. It has now become more widely spread, particularly in sandy soils. We have no definite information about its fodder value, but it belongs to a wholesome family, and should say is quite good feed.

Two Grasses from the Downs.

"Inquirer" (Toowoomba)—

The tall grass specimen is *Eleusine indica*. This grass is spread very widely over the warm temperate regions of the world. It is very common in Queensland, and mostly grows as a weed of cultivation. It is extremely strong-growing, with a very tenacious hold of the ground. Like some of the sorghums it produces prussic acid yielding glucocide, especially in its more luxuriant forms. Very little trouble, however, has been experienced with it in Queensland. It is most commonly known as crowsfoot grass, but is not to be confused, of course, with the common herbage of that name on the Darling Downs.

The other grass is *Urochloa panicoides*, the species of which are excellent fodder. They are native grasses, but, unlike most native grasses, prefer ground that has been broken or disturbed, such as cultivation paddocks. They are rarely found in the ordinary pasture. We have not heard a suitable popular name for this grass.

"Milky Plum." A wild fruit. A native plant (Ginger Species).

S. (Townsville)—

1. *The Nut:* This is *Lucuma castanospermum*, commonly known as the milky plum in North Queensland. It is rather a handsome tree, with glossy green foliage.

2. *The Fruit:* This is *Siphonodon membranaceum*. We have not heard a common name applied to this tree. In Southern Queensland, an allied tree is known as ivorywood. The fruit of the North Queensland plant is said to have been eaten by the aboriginals, but, as far as we have observed, it is much too woody in texture to be edible.

3. *The Leaf:* We think this belongs to *Curcuma australasica*, a native plant of the ginger family. It has rather an ornamental flower, and is worth growing as a garden plant.

Soil for Pineapples and Other Fruit.

A.J. (Petrie)—

If you send your full name and address to the Under Secretary, Department of Agriculture and Stock, Brisbane, information on pineapple culture and soil analysis will be sent to you direct.

Brazilian or Mexican "Clover."

INQUIRER (Townsville)—

The specimen is *Richardsonia brasiliensis*. This plant is commonly known as Brazilian or Mexican clover. It is, however, not a member of the clover family, and is in no way related to the legumes. It has been highly spoken of as a fodder, but our experience with it in Queensland is simply as a bad weed of cultivation, particularly on fruit farms, where it grows between pineapple rows and is extremely difficult to eradicate. So far as we have observed, stock do not take very readily to it.

Forest Blue Grass. Wild Millet.

E.G.N. (Rannes)—

The tall-growing specimen with the fluffy top is *Bothriochloa intermedia*, forest blue grass, a very widely spread grass in Queensland, being very abundant in the Callide Valley and parts of Central Queensland. It is generally regarded as quite a good stock feed, but we have never heard of its cultivation. It would be an interesting experiment.

The smaller grass is *Echinochloa colona*, commonly known as wild millet. This grass is very closely allied to such well-known cultivated fodders as Japanese millet and white panicum.

Trees Suitable for the Taroom District.

S.C. (Taroom)—

Following is a list of trees worth a trial in your district:—

Chinese Celtis (*Celtis sinensis*).—This, we think, is one of the most satisfactory trees. It is being grown in some of the western towns with great success. The tree is sometimes called Portuguese elm, although this name belongs more correctly to an allied species.

Bottle Tree (*Sterculia rupestris*).—This tree transplants fairly well when well grown. Young trees may be taken from the scrub. This was done successfully at Roma a few years ago.

Kurrajong (*Sterculia diversifolia*), White Cedar (*Melia dubia*).—Both are kept in stock by most nurserymen.

Jacaranda (*Jacaranda mimosæfolia*), Silky Oak (*Grevillea robusta*), Camphor Laurel (*Cinnamomum camphora*).—All are worthy of a trial. Without local knowledge we would not advise planting them on a large scale. All are stocked by most nurserymen.

Native Bauhinia (*Bauhinia Hookeri*).—A very handsome tree but rather slow growing. It should do very well in your district.

Carob Bean (*Ceratonia siliqua*).—Worthy of trial.

Honey Locust (*Gleditschia triacanthos*).—This tree has been grown fairly extensively on parts of the Downs and does quite well as a street tree. Objections to it are its large thorns and its susceptibility to borer attack.

Bindweed.

L.K. (Warwick)—

The specimen is the bindweed, *Convolvulus arvensis*, a very aggressive weed in the Southern States. It has been established in Queensland for only a few years, and seems to be definitely on the increase, although it does not spread here, apparently, to the same extent that it does in New South Wales and Victoria. It is one of the worst weed pests so far introduced to the Downs. It produces a large number of underground runners. Any part of these cut with a spade or plough forms a new plant. A weak arsenical solution poured into the patch may be tried, but would probably have to be done several times before eradication would be complete. A Downs farmer has informed us that pigs, being very fond of the underground parts of the plant, are useful in keeping it in check if not eradicating it entirely.

Fanflower Weed.

H.T.B. (Jandowae East)—

The specimen is fanflower weed, *Scævola æmula*. The local name comes from the spreading habit of the flower, something like a small fan. It is a native plant with a wide distribution in the Eastern States from Central Queensland to Victoria. Like some other plants with a well-developed underground root system, it has the power of forming fresh plants from small underground parts when they happen to be cut with a hoe or plough. This type of weed is rather difficult to get rid of, and if ordinary cultural methods fail, they may be sprayed with a very weak arsenical solution or with ordinary waste salt, such as butcher's salt. The former method is impracticable where stock are running, and the latter, although harmless to stock, has the disadvantage of making the ground sterile for about a season, or perhaps longer if the weather is dry.

Trees for St. George District.

Inquirer (St. George)—

The following trees are likely to do well in the country around St. George:—

Bottle Tree (*Sterculia rupestris*).
Kurrajong (*Sterculia diversifolia*).
Bauhinia Hookeri (Queensland Bauhinia).
Celtis sinensis (Portuguese Elm).
Privet (*Ligustrum lucidum*).
Pepper Tree (*Schinus molle*).
White Cedar (*Melia dubia*).
Torulosa Pine (*Cupressus torulosa*).
Jacaranda (*Jacaranda mimosæfolia*).
Phytolacca or Bella Sombra Tree (*Phytolacca dioica*).
Cape Chestnut (*Calodendron capense*).

Plane Tree.—This is worth trying. Sometimes it does not seem to succeed in localities where one would think it had every chance of success. Are there any well-grown plane trees about St. George? You could, of course, try a few to see how they turn out.

Tamarind.—We think the winters at St. George would be too severe for the tamarind.

Li-chee.—See tamarind.

Grevillea.—We presume you mean the red flowering variety, *Grevillea Forsterii*. We think there is every chance of this succeeding at St. George. It is at most, however, only a small tree, and is frequently grown as a shrub. Another species of Grevillea, the Silky Oak (*Grevillea robusta*) is a fair-sized tree and should do quite well in your district.

Shrubs—

Brunfelsia latifolia.
Hibiscus (Syriacus or deciduous type).
Hibiscus (*Rosa sinensis* or evergreen type).
Oleander (*Nerium oleander*).
Spiræa Reevesiana (May).
Tamarix (*Tamarix gallica*).
Tecoma capensis.
Tagasaste (*Cytisus proliferus*).
Indian Hawthorn (*Rhaphiolepis indica*).
Laurustinus (*Viburnum tinus*).

Bougainvilleæ also may be grown as a shrub. Some of the hardier sorts would probably do quite well. One of the best is *Traillii magnifica*.

Lawn Grasses.—You have a choice of buffalo grass, couch grass, and kikuyu. If you have a good water supply we think it likely that you will find buffalo the most satisfactory; although if your lawns are too big to water, probably the common couch would be the best.

We have kept the list to plants usually obtainable from ordinary nurseries, but some of the trees—bottle, Portuguese elm, and Queensland bauhinia—might be difficult to procure.

Eriochloa Grasses.

W.G.S. (Ambrose)—

The grass is a species of *Eriochloa*. Several species of *Eriochloa* grow in Queensland, but the genus is at present under review, and we are not able to give you the specific name. All species of *Eriochloa*, however, generally go under the name of early spring grass, although this name is not particularly appropriate, as they are essentially summer grasses and do not respond to spring rains more than most of the other grasses of their type. They are all good fodders, nutritious and much relished by stock. They are commonly seen in the ordinary pasture, but, on the whole, prefer ground that has been broken up or disturbed in some way, such as around cowyards or old cultivation paddocks. The seeds of these grasses are not stocked by nurserymen. They mostly spread naturally when once introduced into a locality.

General Notes

Staff Changes and Appointments.

The following members of the Farleigh Mill Suppliers' Committee have been appointed honorary protectors under the Fauna Protection Act:—

> Messrs. J. J. Hand (Reliance Creek, Mackay), H. G. Mulherin (Cameron's Pocket, via Calen), A. Fordyce (Eimeo Road, Mackay), S. Hamilton (Glenella, Mackay), A. P. Donnelly (Farleigh), P. Kirwan (Dumbleton, Mackay), J. Trevaskis (Farleigh), and H. C. J. Hansen (Pioneer).

Messrs. F. C. Jorss (Maryborough), R. J. Rollston (Greenslopes), and H. Lambert (Acacia Ridge) have been appointed assistant inspecting cane testers for the forthcoming sugar season, with headquarters at Cairns, Mackay, and Bundaberg, respectively.

Messrs. H. Sbresnie (Oyster Creek, via Rosedale) and A. W. W. Rothan (Palmwoods) have been appointed honorary protectors under the Fauna Protection Act, and Mr. P. E. Bell, of Mutarnee, Ingham line, has been appointed an honorary protector under the Fauna Protection Act and an honorary ranger under the Native Plants Protection Act.

Mr. D. R. L. Steindl, assistant to pathologists, has been appointed assistant pathologist, Bureau of Sugar Experiment Stations.

Alderman R. Turnbull, of the Toowoomba City Council, has been appointed an honorary protector under the Fauna Protection Act.

Messrs. F. C. Jorss, R. J. Rollston, and H. Lambert, assistant inspecting cane testers at Cairns, Mackay, and Bundaberg, respectively, have been appointed also cane testers at each of the sugar mills in their respective districts.

The following have been appointed cane testers for the forthcoming sugar season at the mills specified:—Mr. G. Becker (Inkerman), Mr. C. J. Boast (Moreton), Miss D. Bowder (Babinda), Mr. T. Breen (Pioneer), Mr. L. Chadwick (Plane Creek), Miss E. Christsen (Maryborough), Mr. P. H. Compton (Pleystowe), Mr. T. F. Corbett (Kalamia), Mr. T. D. Cullen (Millaquin), Mr. L. G. F. Helbach (Bingera), Mr. T. Herbert (South Johnstone), Mr. L. C. Home (Invicta), Mr J. Howard (Rocky Point), Mr. C. H. Humphreys (Tully), Mr. H. C. Jorgensen (Marian), Miss A. L. Levy (Farleigh), Mr. J. McFie (Mount Bauple), Mr. S. McRostie (North Eton), Miss M. A. Morris (Gin Gin), Miss J. O'Flynn (Mossman), Miss J. Orr (Racecourse), Miss I. Palmer (Proserpine), Mr. W. Richardson (Isis), Miss M. T. Smith (Qunaba), Mr. G. Tait (Mulgrave), Mr. F. W. Trulson (Cattle Creek), Mr. R. D. Woolcock (Mourilyan), and Mr. V. F. Worthington (Fairymead).

The following have been appointed assistant cane testers for the forthcoming sugar season at the mills specified:—Miss D. Aldridge (Bingera), Miss A. Anderson (South Johnstone), Mr. R. Anderson (North Eton), Miss K. Backhouse (Plane Creek), Mr. P. C. Boettcher (Tully), Mr. C. Boone (Pleystowe), Mr. A. Byrne (Racecourse), Mr. L. C. J. Clifton (Pleystowe), Mr. D. M. Corbett (Pioneer), Miss E. A. Crees (Invicta), Mr. E. J. Delaney (Isis), Miss P. G. Eadie (Proserpine), Miss F. Foubister (Racecourse), Mr. H. J. Heidke (Fairymead), Mr. V. W. Keating (Marian), Mr. J. D. Kinnon (Kalamia), Mr. G. R. Kronk (Farleigh), Miss M. A. Lyle (Inkerman), Mr. J. Mackenzie (Bingera), Mr. R. A. Mahoney (Kalamia), Miss M. H. Makings (Marian), Mr. C. M. Martin (Plane Creek), Mr. V. B. Martin (Cattle Creek), Mr. J. H. Murtagh (Proserpine), Mrs. M. E. Nally (Qunaba), Mr. R. D. R. Rex (Maryborough), Miss E. M. Rowe (Fairymead), Mr. W. P. Snewin (Isis), Miss P. Southwick (Pioneer), Mr. C. W. Steley (Invicta), Mr. R. A. Stephenson (Millaquin), Miss M. Thorburn (Millaquin), Mr. J. Y. Taylor (Moreton), Mr. P. A. Van Lith (Moreton), Mr. D. Walton (Babinda), Miss M. E. L. Wassell (Farleigh), and Miss S. Wilkinson (Tully).

Wild Life Preservation.

Approval has been given for the deletion from the North Queensland Coast and Atherton Tableland bird and animal sanctuary of the Shire of Cardwell and that portion of the Shire of Hinchinbrook hitherto included within that sanctuary.

THE LATE Mr. GRAHAM—FINE TRIBUTES.

"Countryman," of the Australian Broadcasting Commission, made this graceful reference to the passing of Mr. Graham in the course of the Countryman's Session broadcast over the State network of national and regional radio stations:—

"With a strong faith in the principle of farmers' co-operation, Mr. Graham lived to see a sound system of orderly marketing established in Queensland. His ability, courtesy, tact, balanced judgment, wide knowledge of rural enterprise in all its branches and a sympathetic understanding of the producer and his problems were factors in the success of a notable career. A practical dairy farmer, he could select a cow, grow feed for her, milk her and manufacture the product into high-grade butter and cheese. The scientific side of agriculture had for him the strongest attraction, and few men were more widely read in its literature.

"In every district throughout the Queensland countryside, sincere regret is felt for Mr. Graham's untimely passing. Literally, he died in harness after labouring long and faithfully to the limit of a great capacity—and, towards the end, with magnificent courage in the gathering shadow of death—for the betterment of the conditions of the primary producers."

At meetings of the Queensland Butter Board, the Queensland Cheese Board and the Queensland Dairy Products Stabilisation Board, highly commendatory remarks were made by speakers on the work Mr. Graham had done for the dairy industry. Other associations of producers also have recorded their appreciation of Mr. Graham's work and guiding influence in the realm of agricultural economics.

Referring to the passing of the late Under Secretary and Director of Marketing of the Department of Agriculture and Stock, the "Queensland Producer" paid this fine tribute to a man who gave great service to the farmers of Queensland:—

"From the very outset a firm believer in the principle of grower-controlled co-operative marketing, Mr. Graham lived to see the patient work of years towards this laudable objective crowned with ultimate success. And it is fitting that a generous tribute be paid for the active part he played in bringing about the consummation of such ideals and hopes during the early stages when doubts were freely expressed and opposition was by no means absent.

"Later, as Government representative on the various commodity boards and as Director of Marketing, he rendered signal service in promoting a spirit of unity and assisting to overcome many problems which cropped up from time to time. His singleness of purpose and unselfish labours in helping to place Queensland co-operative marketing on the map as an example worthy of many other countries to follow will ever remain a monument to his memory. The ranks of the pioneers are becoming thinned with the march of time, but, in common with others who have earned well from the community, he will not be forgotten.

"Mr. Graham's innate courtesy and tact were important factors contributing to his successful career and steady advancement in the Department of Agriculture and Stock, and made him a wide circle of friends amongst the primary producers of Queensland. Moreover, his unassuming manner and realistic understanding of the difficulties of the man on the land were largely responsible for the esteem in which he was held in the rural community. Pre-eminently a man of wide human sympathies, his rôle of kindly mentor and guide came natural to him.

"There was probably no officer connected with the Department of which he occupied the important position of Under Secretary whose helpful and practical advice was more valued by primary producers, and there is no doubt that sincere regret will be felt at his passing. He laboured long and faithfully in the cause of agriculture and for the betterment of conditions of the toilers on the land. The directors and editorial staff of the 'Queensland Producer' join in tendering their sincere sympathy to his sorrowing family."

Rural Topics

A Satisfied Scotsman.

A Galloway farmer, now farming in Victoria (Australia), wrote recently as follows to "The Scottish Farmer: "If Scotsmen at home had any idea at all (which they haven't) of what a magnificent country this is—the finest land and the finest climate in all the world—they wouldn't stay at home and 'tramp red' farms on the market to let, and offer rents extortionate to get a farm and a living under very adverse conditions. Victoria is all good, but Gippsland is the garden of Victoria, with good land and an assured rainfall. There is no housing for stock, no byres (an Australian would wonder what a byre was); run your eighty or one hundred cows into a milking shed, eleven or twelve stalls (single); a good milking machine; do your cows fifty in the hour (a five-unit plant)—and there you are. Gallop in your draught horses on a 'stock hack'—a thoroughbred pony (Australians don't walk; it is said they would walk a mile to catch a horse to ride half a mile); and get your teams agoing. Australian girls are all splendid riders, and can gallop and 'stock ride' with the best men. I have a girl whom I employ for droving and she is more reliable than any man."

"Save Our Soil"—the Farmer's S.O.S.

Grass anchors soil against erosion. Its decaying remains make the soil absorbent, roots bind the soil and open tiny conduits into the earth, and blades and stalks impede the downward flow of water. Slow water does little damage, and grass makes running water creep. Soil conservation makes extensive use of grass. Good pastures shed little water and lose very little soil. Trees place a roof over the soil, cover it with a carpet, and tie it with grasping roots. Rain strikes gently beneath a tree, and running water is obstructed by countless twigs and leaves which form the carpet covering of the soil. Furrows up and down a slope are really gutters that concentrate and speed the rain run-off with its burden of top soil. Furrows around a slope are really dams that hold the rainfall and store it in the vast reservoir, the soil.

—*H. A. Wallace, of the United States Soil Conservation Service.*

The Management of the Bull.

The bull should be kept away from the rest of the herd in a separate run securely fenced and provided with water and shelter. A small service yard and a crush to facilitate the handling of the bull when necessary, should also be provided.

The advantages gained by keeping the bull away from the herd are:—

1. Calving can be regulated.
2. It is easier to decide whether or not the cow is in calf.
3. The bull's services are controlled and not wasted.
4. There is less likelihood of the cows having to return to the bull.

If the run is placed well away from a public road any annoyance caused by a neighbour's cows breaking into the bull or the bull breaking out is avoided.

Top-dressing Pastures.

The best way of ensuring evenness of sward in a grass paddock and consequent pasture efficiency is to make good use of harrows for the spreading of animal manure, in addition to sound grazing practice and regular top dressing. The spreading of the stock manure serves a double purpose, since it not only makes use of stock nitrogen but keeps the pastures clean and even.

Because of lack of minerals in their food dairy cows chew bones and swallow all kinds of junk—nails, wire, rusty tins, and other mineral substances. Eaten-out pastures are the chief cause of this deficiency, and that can be rectified only by better pasture management or the provision of the necessary minerals in the stock food.

Some farmers are quite willing to grow 10 acres or more of crops for dairy cattle, but often jib at spending less on the cultivation of their biggest and best crop—grass.

De-horning Cattle.

There is every reason for favouring the practice of dehorning cattle while the animals are in the calf stage. One of the best methods is the application of caustic soda to the horn buttons, which are easily felt when the calves are a few days old. The skin around each button should be protected by smearing it with vaseline and the button itself carefully rubbed with the caustic pencil, the operator being very careful not to let the caustic touch the skin itself. For the same reason, the caustic must not be handled with the fingers, but slipped for use into a metal holder, such as an ordinary pencil holder. Four applications are generally sufficient, when the buttons will peel off. This operation is said to give no pain to the calf so treated.

Is Disease Spread by Starlings?

Evidence available in England supports the view that foot-and-mouth disease was conveyed to that country from Europe by migrating starlings. The disease is still prevalent in the Old Country, although by its policy of slaughter and isolation of infected animals, the Government veterinary officers have succeeded in stopping the spread of the disease from farm to farm. The trouble seems to be severe in dairying districts, and the interesting theory in explanation of this is that the modern dairy cow has lost resistance to disease through being bred intensively for high milk yields.

Livestock Standards.

In setting up beef and mutton and pork standards the United States Department of Agriculture has reduced grade factors to three—conformation, finish, and quality.

Conformation is regarded as a question of proportion, and not of size. As a rule the animal or carcase that shows the best proportion possesses the highest degree of conformation.

Finish is fat. It involves not only the quantity of fat but also the character, quality, and distribution of the fat. A carcase to rank high in finish must possess an approved proportion of fat to lean, and the fat must be of high quality and must be smooth and evenly distributed within the limits set by nature.

Quality is perhaps the most comprehensive of all grade factors and the hardest to define. A high-quality animal must possess refined bone, a mellow hide, and relatively thick muscles.

The Menace of Soil Erosion.

Evidences of the progress of soil erosion are to be seen in every farming district. If definite cases are to be quoted, plenty of examples come to mind. Yields of fruit from many orchards on the Blackall Range and around Gosford (New South Wales) have decreased both in quality and quantity in recent years. In other places orchards have had to be abandoned from this cause. Cases can be quoted of wheat farms in New South Wales where yields have decreased by half as the top soils have been washed away and gullies developed. Hundreds of paddocks have had to be taken out of cultivation because of erosion, and are now carrying only second-grade pastures. Failure to control soil erosion must result in decreased production in the near future, and in many cases so soon that the financial position of the farmers concerned will be seriously weakened.

Production from the Land.

Comparative figures are doubtless interesting and helpful at times, but I think it was Andrew Lang who said that many people use them as a drunken man uses a lamp post—for support rather than for illumination. If a 20 per cent. gross increase of agricultural production, as reported, has been attained during the past six or seven years without being noticeable, it only emphasises what can be done with a little encouragement, and how great the possibilities are for further progress.

—*"Blythe," in The Farmer and Stock Breeder (England).*

An M.P.'s Evidence.

Speaking at a Farmers' Union dinner in England, Captain Beaumont, of the British House of Commons, remarked: "The principal evidence of success to agriculture that I can give you is that I am going in for farming myself."

Orchard Notes

JULY.

THE COASTAL DISTRICTS.

THE marketing of citrus fruits will continue to occupy the attention of growers. The same care in the handling, grading, and packing of the fruit which has been so strongly recommended in these monthly notes must be continued if satisfactory returns are to be expected. It is pleasing to note that citrus fruits coming on to the Brisbane market continue to show quality in grading, packing, and colouring.

Where the crop has been gathered, the trees may be given winter pruning if necessary—such as the removal of broken or diseased limbs or branches, and the pruning of any superfluous wood from the centre of the tree. Where gumming of any kind is seen it should be at once attended to. If at the collar of the tree and attacking the main roots, the earth should be removed from around the trunk and main roots—all diseased wood, bark, and roots should be cut away, and the whole of the exposed parts painted with Bordeaux paste. When treated, do not fill in the soil around the main roots, but allow them to remain exposed to the air for some time, as this tends to check any further gumming. When the gum is on the trunk or main limbs of the tree cut away all diseased bark and wood until a healthy growth is met with, and cover the wounds with Bordeaux paste.

Towards the end of the month all young trees should be carefully examined for the presence of elephant beetles, which, in addition to eating the leaves and young bark, lay their eggs in the fork of the tree. When the young hatch out they eat their way through to the wood and then work between the wood and the bark, eventually ringbarking one or more of the main limbs, or even the trunk. A dressing of strong lime sulphur to the trunk and fork of the tree, if applied before the beetles lay their eggs, will act as a preventive. In the warmer localities a careful watch should also be kept for the first appearance of sucking bugs, and to destroy any that may be found. If this is done systematically by all growers, damage by this pest will be much reduced.

Citrus trees may be planted throughout the month. All worn-out trees should be taken out, if the root system is too far gone to be renovated; but when the root system is still good the top of the tree should be removed until sound, healthy wood is met with, and the portion left should be painted with a strong solution of lime sulphur. If this is done the tree will make a clean, healthy growth in spring.

The inclusion of a wide range of varieties in citrus orchards is not recommended. Far too much consideration is given to the vendor's description for the purchaser's appreciation of a particular variety or varieties. Individual tastes should be subordinated to market requirements, and the selection of varieties restricted to the best available kind of early, medium, and late fruits. Among oranges, Joppa should be placed first, Sabina for early fruit, and Valencia for late markets.

With mandarins, local conditions influence several varieties, and since the introduction of the fungus known as ''scab'' the inclusion, particularly on volcanic soil, of the Glen Retreat and Emperor types is risky. In alluvial lands, Emperor and Sovereign (an improved Glen Retreat) are the most profitable, although Scarlet in many places is worth including, with King of Siam as a late fruit.

Land intended for bananas and pineapples may be got ready, and existing plantations should be kept in a well-cultivated condition.

Bananas intended for Southern markets may be allowed to become fully developed, but not coloured, as they carry well during the colder months of the year.

The winter crop of smoothleaf pines will commence to ripen towards the end of the month, and when free from blackheart (the result of a cold winter) or from fruitlet core rot, they are good for canning, as they are of firm texture and stand handling. Where there is any danger of frost or even of cold winds, it pays to cover pines and also the bunches of bananas. Bush hay is used for the former and sacking for the latter.

Strawberries should be plentiful during the month. Like all other fruits, strawberries pay well for careful handling, grading, and packing. Well-packed boxes always realise a much higher price than those packed carelessly.

When custard apples do not ripen when gathered, try the effect of placing them in the banana-ripening rooms, and they will soon soften instead of turning black.

THE GRANITE BELT, SOUTHERN AND CENTRAL TABLELANDS.

JULY is a busy month for the growers of deciduous fruits, as the important work of winter pruning should, if possible, be completed before the end of the month, so as to give plenty of time for spraying and getting the orchard into proper trim before the spring growth starts.

Pruning is one of the most important orchard operations, as the following and succeeding seasons' crops depend very largely on the way in which it is done. It regulates the growth as well as the number and size of the fruit, for if too much bearing wood is left there is a chance of the tree setting many more fruits than it can properly mature, with a result that unless it is rigorously thinned out the fruit is under-sized and unsaleable. On the other hand, it is not advisable to unduly reduce the quantity of bearing wood, or a small crop of overgrown fruit may be the result. Apples, pears, and European varieties of plums produce their fruits on spurs that are formed on wood of two years' growth or more; apricots and Japanese plums on new growth and on spurs; but peaches and nectarines always on wood of the previous season's growth. Once peachwood has fruited it will not produce any more from the same season's wood, though it may develop spurs having a new growth or new laterals which will produce fruit. The pruning of the peaches and nectarines, therefore, necessitates the leaving of sufficient new wood on the tree each season to carry a full crop, as well as the leaving of buds from which to grow new wood for the succeeding year's crop. In other words, one not only prunes for the immediately succeeding crop, but also for that of the following season. All prunings should be gathered and burnt. When pruned, the trees are ready for their winter spraying.

All kinds of deciduous trees may be planted during the month, provided the ground is in proper state to plant them. If not, it is better to delay planting until August, and carry out the necessary work in the interval. The preparation of new land for planting may be continued, although it is somewhat late in the season, as new land is always the better for being given a chance to mellow and sweeten before being planted. Do not prune vines yet on the Granite Belt; they can, however, be pruned on the Downs and in the western districts.

Trees of all kinds, including citrus, may also be planted in suitable situations on the Downs and western districts, and the pruning of deciduous trees should be concluded there.

TO KEEP A WIRE FENCE STRAINED.

This device will be found useful for preventing wire fences becoming slack as they tend to do in the course of time.

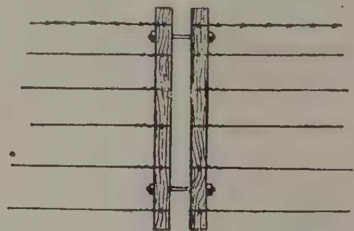

Plate 222.

The materials required are two battens 4 in. x 2 in. and two stout bolts with thread cut at each end. Drill holes in the battens to take the bolts, attach the fence wires securely and then insert the bolts, when the whole fence can be strained by tightening the nuts with a spanner.

This apparatus can be used on an ordinary strained fence and one is required for every twenty chains.

Farm Notes

JULY.

FIELD.—Practically the whole of the work on the land for this month will be restricted to the cultivation of winter crops—which should be now making good growth—and to the preparation of land for the large variety of crops which can be sown next month. Early maturing varieties of wheat may be sown during the month. Sow late maturing varieties early and early maturing varieties late.

The harvesting of late-sown maize will be nearing completion, and all old stalks should be ploughed in and allowed to rot.

Clean up all headlands of weeds and rubbish, and for this purpose nothing equals a good fire.

Mangels, swedes, and other root crops should be now well away, and should be ready for thinning out. Frosts, which can be expected almost for a certainty this month, will do much towards ridding the land of insect pests and checking weed growth.

Cotton-picking should be now practically finished and the land under preparation for the next crop.

The young lucerne should be becoming well established; the first cutting should be effected before the young plants reach the flowering stage, as, although such an early mowing is seldom worth gathering, it has the effect of stimulating root growth, to the benefit of subsequent cuttings, which are usually made when approximately one-third of the plants have reached the flowering stage. If weed growth is prevelant during the spring months, frequent cutting is often necessary as a control to prevent seeding.

DISINFECTION.

The object of disinfection is to destroy organisms and ultra-visible viruses which cause disease. It is a job which should certainly be done after the occurrence of one or more cases of contagious disease—such as tuberculosis, contagious abortion, swine fever, and influenza.

Periodical disinfection of stables, byres, piggeries, and poultry runs is highly commendable as a measure of disease prevention.

The extent and thoroughness of the work would depend on the nature of the disease which had occurred, and would not need to be so extensive or intensive when merely carried out as a routine measure.

A common error in disinfecting premises is to first remove accumulations of excreta, discharges, dirt, and dust. Otherwise, the causal organisms and viruses contained in the accumulations are disseminated throughout the building, and may lodge in places which cannot be easily covered by the disinfecting solution afterwards.

The proper way is first to apply liberally to all parts of the premises a suitable disinfectant in solution, and to leave it in contact for twenty-four hours.

After the disinfectant has been allowed to act for that period, the walls and floors should be scraped (or scrubbed), and the scrapings soaked with kerosene and burnt.

Suitable solutions are phenol or other coal tar preparation (1 pint to 4 gallons water), chloride of lime (1 lb. to each gallon of water), or crude carbolic acid (1½ pints to 4 gallons water), to be sprayed on all surfaces.

If shearing sheds and yards are disinfected before shearing commences, losses of stock through infection of wounds may be avoided.

Our Babies.

Under this heading a series of short articles, by the Medical and Nursing Staffs of the Queensland Baby Clinics, dealing with the care and general welfare of babies has been planned in the hope of maintaining their health, increasing their happiness, and decreasing the number of avoidable deaths.

THE NEW-BORN BABE.

Natural Feeding.

During the nine months before birth the mother, through her blood, is providing the food which is necessary for the development of the young child. If the child is to be strong and well at birth the mother must be in good health herself. The importance of this has been stressed in a previous article.

Within the mother's body the child lies doubled up suspended in a comfortably warm fluid, everything is done for him, he does not require either to eat or to breathe. From this comfortable state of dependence he is suddenly born into the world. With his first cry a new order of things begins. A new type of circulation is established, his oxygen is now obtained from the air instead of through the mother's blood, he has to do his own work of digestion and to get rid of his waste products through his own excretory organs. In other words, he has to become self-supporting.

In this land of ours most babies are born healthy, and it is within the mother's power to keep them healthy. Why is it that a number of our infants, during the first two or three months of their lives, do not make satisfactory progress? In most cases it is the result of wrong methods of feeding, and particularly of the failure of the mother to feed her baby naturally. If mothers realised the value of breast milk very few would be unable to feed their infants either fully or partly. Nature has evolved a wonderful plan whereby the stomach is gradually

educated to digest food. For the first few days there is found in the breasts a thin watery-looking fluid—a most valuable food containing a large percentage of one of the constituents of blood. This can be absorbed with comparatively little effort by the stomach whose function is slowly becoming established. Gradually this fluid is changed into milk, and in this way Nature provides a perfect transitional food for the infant.

The child who is denied his birthright—his own mother's milk—receives early in life a food of an unnatural sort. However, it may be modified, cow's milk can never be made into anything approaching human milk. Further, the exercise of sucking the breast promotes a good supply of blood to the jaws whose development is assisted and good spacing of sound teeth encouraged. In nursing her baby the mother tends to improve her own health by aiding the natural physiological changes occurring in her body. The importance of a right start for both mother and infant cannot be over-emphasised.

It is unfortunate that in so many instances the decision to discontinue the efforts to establish natural feeding is so readily made. Artificial feeding often has its origin in the small bottle of diluted milk solution given when the child is a day or two days old, by a nurse who may not have the time or in some cases the experience necessary to overcome certain difficulties which may arise in connection with feeding. The nurse who has not had experience in infant welfare work is handicapped in handling such babies. In some cases the flow of milk may be delayed beyond the usual few days, or the child may be slow in learning to suck. If this occurs attempts to train the infant to suck should be continued for some weeks, as it often happens that natural feeding is established ultimately. The best stimulus to the flow of milk is the regular sucking by the baby. In certain cases where it has been necessary to separate the child and the mother, as in the case of sickness of one or other, natural feeding has been re-established after an interval of several weeks.

Natural feeding is the baby's best protection against disease; it prevents certain diseases and protects against others. Persevere in your efforts to establish natural feeding, and when you are in difficulties, seek the assistance of a nurse who can help you.

IN THE FARM KITCHEN.

VEGETABLES ON THE MENU.

Stuffed Marrow.

Take 1 medium-sized vegetable marrow, 2 cupfuls breadcrumbs, 1 egg, ½ pint cheese sauce, 2 tablespoonfuls butter, 1 tablespoonful chopped parsley, 1 medium-sized onion, ½ cupful chopped cooked ham, stock or milk to moisten, pepper and salt.

Cut off a slice from either end of marrow. Remove seeds and membrane, then peel. Parboil in salted water for five minutes. Heat butter in a saucepan. Add chopped onion, breadcrumbs, parsley, and ham, then the beaten egg and stock or milk to moisten. Season to taste with salt and pepper. Drain marrow, and fill shell with the mixture. Cover with the sauce. Bake in a moderate oven for about forty-five minutes or till brown and tender. Serve with potatoes (boiled) as the main dish for dinner.

Vegetable Marrow a l'Espagnole.

Take 1 vegetable marrow, 3 tomatoes, 1 onion, 2 oz. butter, ¾ pint stock, salt, pepper.

Peel the onion and slice it. Melt the butter in a saucepan, put in the onion and fry without browning, slice the tomatoes, add them to the onion, and cook a little. Peel the marrow, cut it in quarters, take out the seeds, and slice it into pieces about 2 inches square; add these to the onion and tomatoes, season with pepper and salt, add the stock, and stew gently until the marrow is tender. When the marrow is sufficiently cooked, turn it on to a hot dish, place the onion and tomato over it, and serve.

Little Moulds of Carrots.

Take 8 large carrots, 1 whole egg, 1 egg-yolk, butter, stock, salt, pepper, 1 hard-boiled egg-white, white sauce.

Wash the carrots and slice off the red part of them. Melt some butter in a saucepan, put in the pieces of carrot, and cook them in it for about ten minutes, stirring constantly; add some white stock, and cook until tender. Drain well, and rub through a fine sieve. Return the puree to the saucepan, add the whole egg and the yolk, stir over the fire until thoroughly mixed. Butter some small dariole moulds and decorate the bottom of each with a star of hard-boiled egg-white, fill up with the carrot mixture, and cook in a slow oven in a baking tin containing water for fifteen to twenty minutes. Before putting them in the oven, cover with a buttered paper. When done, turn out on to a hot dish, pour hot white sauce round, and serve.

Beetroot with Cream.

Take 1 large cooked beetroot, ½ pint stock, 1 egg-yolk, 1 gill cream, pepper and salt.

Take a large beetroot, peel it and cut in slices; put it into a stew-pan with the stock and seasoning, stew it gently until quite hot. Strain off the stock. Dress the beetroot on a hot dish; put stock back into the saucepan. Whip the egg-yolk with the cream. Add this to the stock, place it on the gas, and bring to the boil, but it must not actually boil. Pour this sauce over the beetroot and serve.

Baked Cauliflower.

Take 1 large cauliflower, 1½ oz. butter, ¾ oz. flour, ½ pint milk, 1½ oz. grated cheese, breadcrumbs, salt and pepper.

Boil the cauliflower in salted boiling water, taking care not to over-cook it. When ready, lift it out of the saucepan carefully, drain it thoroughly, and place on a well-buttered fireproof dish. Melt 1 oz. of butter in a saucepan, stir in the flour, add the milk, and bring to the boil, stirring all the time; simmer for five minutes, then season with salt and pepper, and add 1 oz. of cheese; pour this sauce carefully over the cauliflower, sprinkle with grated cheese and a few breadcrumbs, put a few bits of butter on top, and place in a hot oven for about ten minutes. Serve very hot.

Croquettes of Parsnips.

Take 4 parsnips, 1 oz. butter, breadcrumbs, 1 tablespoonful cream, lemon juice, 2 eggs, salt, pepper, fried parsley.

Wash, peel, and boil the parsnips in water seasoned with salt and a little lemon juice. When tender, drain and mash them, put them into a saucepan with the butter, stir over the heat until quite hot; season with pepper and salt. Draw the pan off the gas and add one well-beaten egg and the cream; stir over the gas to bind, then turn the mixture on to a plate, and put aside to cool. Divide the mixture into equal portions, make each into a ball or cutlet shape. Dip these into beaten egg, toss in breadcrumbs, place them in a frying basket, and fry in very hot fat. When nicely browned, drain them, arrange on a hot dish, garnish the dish with fried parsley, and serve very hot.

Baskets of Peas.

Take ½ lb. short pastry, 1 oz. butter, ½ pint peas, parsley.

Roll the pastry out thinly, line some small, fluted patty-tins with it, fill them with raw rice, and bake in a quick oven until a pale brown. Remove the rice as soon as the pastry is cooked. Roll out the remainder of the pastry. Cut it out with a round fluted pastry-cutter about 3 inches across; cut the centre out of each round with a cutter one size smaller than the first one used. Divide the rings in halves and bake them a light brown. Boil the peas in the usual way; drain them, and toss in 1 oz. of melted butter. Fill the pastry basket with the peas, put one of the handles in each, and place in the oven for a few minutes. Serve as a separate course. Dish them on a hot dish on a paper d'oyley; garnish with parsley, and serve hot.

The Genius of John Frederick Bailey.

This beautiful tribute to the late Jack Bailey—sometime Government Botanist and a son of the late F. M. Bailey, also a former Government Botanist of Queensland—and his work was paid by the Rev. J. P. Parker, rector of St. Paul's, East Brisbane, who conducted the funeral service.

The world has sustained a loss in the passing of Mr. Bailey. This statement will go unchallenged in Australia, for his memorials are scattered throughout the Commonwealth. To take a piece of practically waste land, especially after it has been further spoiled by man—and turn it into health-giving beauty—requires a genius of no mean order. Such a genius was John Frederick Bailey—and there will always be historians able to tell people what indifferent pieces of land their great gardens were till Mr. Bailey made them beautiful and famous. He had the true characteristic of genius inasmuch as he was able to impart information from his vast knowledge to the ignorant. We believe he is happy with God, who once planted a garden in Eden and put man there to tend it. I am sure we should all be better and happier if we did more of this work as opportunity offers, remembering it is the only manual labour that God definitely decreed for man.

THE ROSE GARDEN.

Roses will never flourish unless the soil in which they are grown is rich in plant foods and well cultivated.

Points to be considered when preparing soil for roses are: The soil may be too retentive of moisture and too cold; or it may be entirely the reverse. Roses of the hardiest group will do well on a great variety of soils. The hybrid perpetuals do best in a cool, but well-drained clay loam, while the tea roses should have a warmer soil, a sandy loam being preferable. However, where it is possible an intermediate type of soil should be chosen which will suit all groups. A soil then should be chosen which is naturally cool and cool soils are usually those with considerable humus and with good moisture-retaining capacity. Clay loams are, generally, naturally richer than sandy loams, and as the rose requires plenty of plant food, the heavier soils also have the advantage in this respect. Shallow soils should not be chosen for roses, as they are liable to become very dry and warm during rainless periods.

Soils where water lies within 3 feet of the surface should not be chosen, as such soils are cold and roses will not bloom well in them. The soil besides being cool should be well-drained, deep, and rich. If the soil is composed of strong clay, it should be trenched to a depth of about four spades and the bottom filled for 6 inches with broken rubble to act as drainage. Unless some material which will rot is incorporated into the full depth of the digging in clay soil, the effect of the water will be to reset the ground, after one thorough soaking, so that it becomes as hard as before. For this reason it is a good thing to incorporate, as the trench is dug, all the aerating matter which can be added—leaves, straw, wood chips, litter, and garden refuse—keeping the finest of this mixture for the top spit. The rougher matter below

will gradually rot and add humus to the lower soil and in its decay give air space where formerly all was compact and airless soil. This is an excellent way of aerating the ground and providing a free root-run, which is one of the essentials to good rose growing. Lastly, unless heavy clay land slopes downwards, it will become waterlogged, hence the rubble footing must have an outlet through a ditch or drain to carry away the water which would otherwise remain.

An ordinary clay soil is favoured by many growers, and if it is treated in the way described, or lightened by the addition of sand, road grit, soot, and other such materials, and dug over early and allowed to lie fallow and exposed to the rigours of the weather and so become thoroughly pulverised, it will grow magnificent roses.

Where the soil is too light it will require the addition of some "body." Clay or heavy clay-loam may be added to light sandy soil to the extent of one-half, and worked to the depth of about 2 feet 6 inches.

The best soil for rose culture is a deep rich loam, sufficiently heavy to retain moisture during the dry season, but so well-drained that it will not become cold and clammy at other seasons. It should be deeply trenched to the depth of at least 2 and preferably 3 feet, forking up the soil at the bottom of the trench. It should be the *aim of every rose grower to bring his soil as near to this ideal as is possible.*

The Principles of Rose Pruning.

A few simple rules govern all rose pruning:—

Cut out all dead and diseased wood, making the cut as close to the base as possible.

Cut immediately above a bud pointing away from the centre of the bush so that the growth may not develop inwards, but outwards, where there is light and air.

Cut in an upward, outward, slanting direction, using a sharp knife which will cut clean, in preference to secateurs which often make a jagged cut and crush the end of the shoot; the cut should be neither too close nor too slanting.

Cut off each growth above the second or third bud counting from the base, provided that: the rose is of normal growth; the bud left is pointing outwards, if not, the cut must be made above the next bud that is.

Cut back hard and well-ripened shoots from 3 to 6 eyes according to variety or wish; cut back weak shoots to fewer eyes.

Where new growths have sprung from the ground-line, cut these back to from 4 to 6 inches high.

Prune hard for weak growth, less severely for medium, and still less for vigorous growth.

Always cut back to dormant eyes.

Pruning should be timed according to the weather, and should not be done if heavy frosts are expected. The operation should always be carefully and properly performed, it will then cause the bushes to bear a wealth of blossoms; indifferently done or without knowledge it will spoil the shape of the tree and cause it to bear second rate blooms. Where the cut is not clean decay is likely to set in; dying back also follows when the cut is not made close to the bud.

The golden rule as regards rose-pruning is that the stronger the growth of the shoot,, the greater number of buds may be left for future development.

NATIONAL RADIO TALKS.

The following programme of national talks, supplied by courtesy of the Australian Broadcasting Commission, will be given over the national network of broadcasting stations, including 2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN, 5AN, 5CK, 7ZL, 7NT.

National talks for Mondays and Wednesdays, 7.40 to 7.55 p.m., are arranged for three or four months in advance. For other days and at other times, they are arranged from month to month.

All times stated are *Eastern Standard Time.*

SUNDAYS.

9.10 to 9.30 a.m.

Countryman's Session each Sunday.

(Queensland Listeners tune in to 4QG, 4RK, or 4QN.)

9.15 to 9.30 a.m.

Special National Talk on the First Sunday in every Month.

(For this Session South-Eastern Queensland must tune in to 4QG instead of 4QR.)

6.30 to 6.45 p.m.

JULY.

3rd—

''AN AUSTRALIAN CREED'' (Series). *''Drifting or Steering.''* (First Talk in this Series.) By Professor Walter Murdoch.

10th—

''Science in the News.'' By Professor W. J. Dakin (Sydney).

17th—

''The Enemies of Progress.'' (Second Talk in the series ''An Australian Creed.'') By Professor Walter Murdoch.

24th—

''Science in the News.'' By Professor W. J. Dakin (Sydney).

31st—

''Wanted—A Common Platform.'' (Third Talk in the series ''An Australian Creed.'') By Professor Walter Murdoch.

AUGUST.

7th—

''Science in the News.'' By Professor W. J. Dakin (Sydney).

8.30 to 8.50 p.m. every Sunday.

''INTERNATIONAL AFFAIRS.''

MAY.

15th—

Dr. E. R. Walker.

22nd—

Dr. G. L. Wood.

MONDAYS.

7.40 to 7.55 p.m.

JULY.

4th—

''Religion.'' By Mr. F. W. Coaldrake (Brisbane). (To be broadcast from Sydney.)

11th—

''AMERICA TO-DAY'' (Series). By Mr. C. Hartley Grattan. *''A Chat on America's Economy.''*

18th—

''A Chat on America's Cultural Life.''

25th—

''NEW ZEALAND'S NEW DEAL'' (Series). By Mr. N. M. Richmond (Brisbane). *''New Zealand's New Deal''*—Part I.

AUGUST.

1st—
"New Zealand's New Deal"—Part II.

8th—
"An American's Views on New Zealand's New Deal." By Mr. C. Hartley Grattan.

TUESDAYS.

A National Talk will be arranged somewhere between 9.30 and 10.0 p.m. each Tuesday.

WEDNESDAYS.

7.40 to 7.55 p.m.

JULY.

6th—
"Why not an Australian Culture?—Another View." By Mr. J. I. M. Stewart (Adelaide).

13th—
"SOME 'OUT OF THE WAY' BOOKS." *"The Saga Spirit."* By Mr. Ian Maxwell (Sydney).

20th—
"Folly in Old France."

27th—
"THIS, CHANGED THE WORLD" (Series). *"Discoveries by Stone Age Man."* By Mr. F. S. Shaw (of Hobart). (Broadcast from Melbourne.)

AUGUST.

3rd—
"Gunpowder." By Professor E. J. Hartung (Melbourne).

10th—
"Coal." By Professor E. J. Hartung (Melbourne).

17th—
"Vaccination." By Professor W. A. Osborne (Melbourne).

24th—
"Bacteria." By Professor W. A. Osborne (Melbourne).

31st—
"The Engineer through the Ages." By Sir Henry Barraclough (Sydney).

SEPTEMBER.

7th—
"Steam." By Sir Henry Barraclough (Sydney).

14th—
"Electricity." By Sir Henry Barraclough (Sydney).

THURSDAYS.

7.40 to 7.55 p.m.

As from 5th June, the National Book Review will be broadcast on Sundays at 10.15 a.m.

FRIDAYS.

7.40 to 7.55 p.m.

A National Talk will be arranged every Friday evening at this hour.

WEDNESDAYS AND FRIDAYS.

2BL, 2NR, 2CO, 3AR, 3GI, 4QR, 4RK, 4QN.

6.0 p.m.

"A FORUM FOR TEACHERS AND STUDENTS."

National Talks on Wednesdays and Fridays are arranged specially to interest young people. Usually these Talks will be broadcast by young people themselves.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE AVERAGE RAINFALL FOR THE MONTH OF APRIL, IN THE AGRICULTURAL DISTRICTS, TOGETHER WITH TOTAL RAINFALL DURING 1938 AND 1937, FOR COMPARISON.

Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	April.	No. of years' records.	April, 1938.	April, 1937.
North Coast.	In.		In.	In.
Atherton	4·24	37	0·79	1·63
Cairns	11·27	56	1·12	6·57
Cardwell	8·75	66	0·12	0·76
Cooktown	8·77	62	1·38	2·12
Herberton	3·77	52	0·47	0·35
Ingham	7·48	46	0 43	0·59
Innisfail	19·95	57	2·41	12·47
Mossman Mill	8·11	25	0·62	3·92
Townsville	3·33	67	0·09	0·15
Central Coast.				
Ayr	2·46	51	..	0·60
Bowen	2·67	67	0·76	1·21
Charters Towers	1·48	56	0·13	0·03
Mackay	6·10	67	0·40	1·02
Proserpine	5·67	35	0·04	1·22
St. Lawrence	2·76	67	0·62	3·04
South Coast.				
Biggenden	2·15	39	2·15	0·58
Bundaberg	3·27	55	3·06	0·60
Brisbane	3·78	86	1·01	0·92
Caboolture	4·51	51	1·60	1·45
Childers	2·82	43	4·10	0·28
Crohamhurst	6·71	45	0·98	2·47
Esk	3·01	51	1·19	1·31
Gayndah	1·44	67	2·92	0·47
Gympie	3·45	68	1·01	0·54
Kilkivan	2·26	59	0·77	0·80
Maryborough	3·87	67	2·92	3·03
Nambour	6·21	42	1·02	1·97
Nanango	1·95	56	0·57	0·27
Rockhampton	2·53	67	3·37	1·58
Woodford	4·65	51	1·45	1·83
Central Highlands.	In.		In.	In.
Clermont	1·58	67	0·34	0·94
Gindie	1·14	39	..	0·66
Springsure	1·53	69	0·46	0·51
Darling Downs.				
Dalby	1·40	68	0·60	0·88
Emu Vale	1·39	42	0·81	0·57
Hermitage	1·40	32	..	0·38
Jimbour	1·38	50	1·05	0·78
Miles	1·45	53	2·05	0·77
Stanthorpe	1·77	65	0·24	1·44
Toowoomba	2·62	66	1·39	0·86
Warwick	1·64	73	1·10	0·31
Maranoa.				
Roma	1·29	64	..	0·32
State Farms, &c.				
Bungeworgorai	1·11	24	..	0·30
Gatton College	1·90	39	..	1·21
Kairi	..	..	..	..
Mackay Sugar Experiment Station	4·63	41	..	1·28

A. S. RICHARDS, Divisional Meteorologist.

CLIMATOLOGICAL TABLE—APRIL, 1938.

COMPILED FROM TELEGRAPHIC REPORTS.

Districts and Stations.	Mean Atmospheric Pressure, at 9 a.m.	Shade Temperature.						Rainfall.	
		Means.		Extremes.					
		Max.	Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cooktown	29·82	86	76	91	14	68	13	138	7
Herberton	..	81	59	89	13, 14	51	12	47	2
Rockhampton	29·94	86	67	96	1, 2	50	28	337	6
Brisbane	29·99	81	63	94	1	50	28	101	8
Darling Downs.									
Dalby	29·99	82	55	93	1	36	27	60	4
Stanthorpe	..	75	47	86	1	28	28	24	4
Toowoomba	..	76	55	86	2	38	28	141	7
Mid-Interior.									
Georgetown	29·88	94	64	99	2	55	13	25	1
Longreach	29·93	92	60	100	1, 2, 12	43	27	..	..
Mitchell	29·98	84	52	94	1	35	27	63	1
Western.									
Burketown	29·87	95	69	102	1, 2	57	28	..	..
Boulia	29·97	91	61	101	3	47	27	..	..
Thargomindah	29·96	85	59	98	16	45	28	2	1

ASTRONOMICAL DATA FOR QUEENSLAND.

TIMES COMPUTED BY A. C. EGLINTON.

TIMES OF SUNRISE, SUNSET, AND MOONRISE.

AT WARWICK.

	June. 1938.		July. 1938.		MOONRISE. June. 1938.	MOONRISE. July. 1938.
	Rises.	Sets.	Rises.	Sets.	Rises.	Rises.
					a.m.	a.m.
1	6·36	5·2	6·46	5·6	8·58	9·7
2	6·37	5·2	6·46	5·6	9·46	9·50
3	6·37	5·2	6 46	5·7	10·32	10·22
4	6·38	5·2	6·46	5·7	11·12	11·7
5	6·38	5 2	6·45	5·8	11·51	11·43
					p.m.	p.m.
6	6·39	5·2	6 45	5 8	12·30	12·22
7	6·39	5·2	6·45	5·8	1·7	1·2
8	6·40	5·2	6·45	5·9	1·42	1·45
9	6·40	5·3	6·44	5 9	2·21	2·30
10	6·41	5·3	6·44	5 9	3·5	3·16
11	6·41	5·3	6·44	5·10	3·44	4·7
12	6·41	5·3	6·44	5·10	4·30	4·59
13	6 42	5·3	6·43	5·11	5·21	5·53
14	6·42	5·3	6·43	5·11	6·10	6·43
15	6·42	5·3	6·43	5·12	7·5	7·36
16	6·43	5·4	6·43	5·12	7·56	8·28
17	6·43	5·4	6·42	5·13	8·48	9·21
18	6·43	5·4	6·42	5·13	9·40	10·17
19	6·43	5·4	6·42	5·14	10·34	11·11
20	6·44	5 4	6·41	5·14	11·27	..
						a.m.
21	6·44	5·5	6·41	5·15	..	12·12
					a.m.	
22	6·44	5 5	6·41	5·15	12·22	1·11
23	6·44	5·5	6·40	5·16	1·22	2.14
24	6·44	5·5	6·40	5·17	2·22	3·10
25	6·45	5·5	6·39	5·17	3·28	4·19
26	6·45	5·5	6·39	5·18	4·26	5·17
27	6·45	5·6	6·38	5·18	5·37	6·10
28	6·45	5·6	6·37	5·1[illegible]	6·38	6·59
29	6·45	5·6	6·37	5·20	7·33	7·42
30	6·45	5·6	6 36	5·20	8·23	8·23
31			6·35	5·21		9·1

Phases of the Moon, Occultations, &c.

5th June	☽	First Quarter	2 32 p.m.
13th "	○	Full Moon	9 47 a.m.
21st "	☾	Last Quarter	11 52 a.m.
28th "	●	New Moon	7 10 a.m.

Apogee, 15th June, at 4.0 a.m
Perigee, 28th June, at 11.0 a.m.

Jupiter, on the same day, will be stationary, which means that the Earth, as seen from the planet, has reached its furthest distance east of it, in this instance, and for a short time will travel directly towards Jupiter. After this period the planet will apparently move with retrograde motion until it reaches its next stationary point, three months hence.

The third and most important event which occurs on the 22nd June is our Winter Solstice. The Sun, in its apparent journey on the ecliptic, the path of the planets, has reached its extreme northern latitude, and will seem to halt in its course, after which, very slowly at first, it will be seen to turn southward.

Venus and a very narrow crescent of the Moon will be seen above the western horizon on the 30th. Their nearest approach will occur after they have set, at midnight.

Mercury rises at 4.54 a.m., 1 hour 42 minutes before the Sun, and sets at 3.50 p.m., 1 hour 12 minutes before it, on the 1st; on the 15th it rises at 5.58 a.m., 44 minutes before the Sun, and sets at 4.23 p.m., 40 minutes before it.

Venus rises at 8.47 a.m., 2 hours 11 minutes after the Sun, and sets at 7.3 p.m., 2 hours 1 minute after it, on the 1st; on the 15th it rises at 9.2 a.m., 2 hours 20 minutes after the Sun, and sets at 7.25 p.m., 2 hours 22 minutes before it.

Mars rises at 7.51 a.m. and sets at 6.5 p.m. on the 1st; on the 15th it rises at 7.32 a.m., and sets at 5.57 p.m.

Jupiter rises at 10.57 p.m. on the 1st, and sets at 12.7 p.m. on the 2nd; on the 15th it rises at 10.3 p.m., and sets at 11.16 a.m. on the 2nd.

Saturn rises at 2.22 a.m. and sets at 2.8 p.m. on the 1st; on the 15th it rises at 1.33 a.m., and sets at 1.18 p.m.

From south-east to south-west the sky is luminous with the constellations Sagittarius, Scorpio, Centaurus, and Argo Navis. About 9 o'clock the brilliant Arcturus in Bootes is almost due north, and in the north-west the two first magnitude stars, Regulus and Spica lie close to the ecliptic. About 8 o'clock the Southern Cross will be upright.

4th July	☽	First Quarter	11 47 p.m.
13th July	○	Full Moon	1 5 a.m.
20th July	☾	Last Quarter	10 19 p.m.
27th July	●	New Moon	1 54 p.m.

Apogee, 12th July, at 7.0 a.m.
Perigee, 26th July, at 9.0 p.m.

For places west of Warwick and nearly in the same latitude, 28 degrees 12 minutes S. add 4 minutes for each degree of longitude. For example, at Inglewood, add 4 minutes to the times given above for Warwick; at Goondiwindi, add 8 minutes; at St. George, 14 minutes; at Cunnamulla, 25 minutes; at Thargomindah, 33 minutes; and at Oontoo, 43 minutes.

The moonlight nights for each month can best be ascertained by noticing the dates when the moon will be in the first quarter and when full. In the latter case the moon will rise somewhat about the time the sun sets, and the moonlight then extends all through the night; when at the first quarter the moon rises somewhat about six hours before the sun sets, and it is moonlight only till about midnight. After full moon it will be later each evening before it rises, and when in the last quarter it will not generally rise till after midnight.

It must be remembered that the times referred to are only roughly approximate, as the relative positions of the sun and moon vary considerably.